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SUMMARY OF RECENT ABSTRACTS*

III. MALARIA

Epidemiology

SHUTE (p. 21) has contributed a note on indigenous malaria in Great Britain.

DOELEMAN and VAN THIEL (p. 670) refer to the epidemic of malaria at Middelburg, Holland, during the war, which was due largely to the fact that military horses kept in the town attracted the anophelines, which became infected on the gametocyte carriers normally present. In Germany malaria is now a serious problem in certain provinces; it has been introduced by returning soldiers and refugees and the lowered standards of health and nutrition have adversely affected the position. WEYER (p. 1050) describes the situation, mentioning the vectors, which are races of *A. maculipennis*.

Writing of malaria in Czechoslovakia after the war, SNUPAREK (p. 480) shows that the introduction of Rumanian and other troops from heavily infected areas spread the disease widely, and that wartime destruction created breeding places for the anophelines already present, *A. claviger*, *A. maculipennis maculipennis* and *A. m. messeae*. Epidemics of malaria have occurred since 1935 in the valleys of certain tributaries of the Danube in Rumania, and ZOTTA, *et al.* (p. 133) show that *P. vivax*, *P. falciparum* and (rarely) *P. malariae* were concerned. Man-made breeding places in river dams have encouraged the vectors, *A. maculipennis messeae*, *atroparvus* and (possibly) *maculipennis*.

The war had a disastrous effect on the malaria position in Italy, and CANAPERIA (p. 229) shows that this was the result of destruction of bridges, dykes and drainage works, dispersal of staff, scarcity of drugs, over-population and the presence of non-immune troops. The increase in malaria occurred in the areas where the important vectors, *A. maculipennis labranchiae* and *A. sacharovi*, are found. Moreover, FERRARO (p. 229) points out that as a result of war destruction, *A. sacharovi* has appeared in places in Italy where it was not previously found. Round Cassino, Italy, malaria spread widely as a result of wartime destruction, and GARACI (p. 671) points out that up to 40 per cent. of the infections were with *P. falciparum*, which was most common in autumn.

DE NEGRI (p. 747) points out that the discovery of marsh gas at considerable depth, near Venice, has led to its exploitation for industry. One effect has been that from the bore holes there also emerges a large amount of saline water which has raised the salt content of neighbouring collections of water so that

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1948, v. 45. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

they now encourage the breeding of *A. sacharovi*, the most formidable vector in this area. MONACI (p. 747) also refers to the outbreaks of malaria which occurred in the neighbourhood of Venice from 1941 onwards, and reports that *A. sacharovi* was found where the endemic malaria was most severe. Discussing malaria to the north of Venice, PATRISSI (p. 673) makes the point that *A. sacharovi* larvae have been found in canal water with a salt content as high as 2·72 per cent. The incidence of malaria was lowest where this mosquito was least abundant. BEADLE (p. 482), however, found *A. sacharovi* breeding in water with very low saline content on the Venetian coast of Italy.

HÖRING (p. 28) describes an outbreak of malaria in German troops near Larissa in Greece ; most of the cases were due to *P. vivax*.

Late spring rains led to a severe outbreak of malaria in the Department of Algiers in 1946 ; *A. maculipennis* was abundant.

MATHIEU (p. 22) gives a short account of malaria in part of Dahomey, where spleen rates in children ranged up to 23 per cent. *P. falciparum* is the common parasite. SAUTET *et al.* (p. 856) draw attention to the frequency of *P. falciparum* in Mauritania.

DE AZEVEDO *et al.* (p. 966) report on a malaria survey of Portuguese Guinea, for details of which the original should be consulted.

SCHWETZ *et al.* (p. 230), as a result of an investigation undertaken along the eastern frontier of the Belgian Congo, conclude that malaria does not spread there at altitudes over 1,700–1,800 metres, and that the high plateaux are free. The chief vectors were not found at that height, and though certain other anophelines were seen, they were evidently not important in transmission. SCHWETZ (p. 484) found high parasite rates round Lake Tumba in the Belgian Congo, though the two mosquitoes *A. moucheti* and *A. gambiae* were rare. SCHWETZ *et al.* (p. 748) note that *P. malariae* is very prevalent in both the Lubilash-Sankuru region and in the Katanga Province of the Belgian Congo, although *P. vivax* is rare. They report on the anophelines found in these places.

HEISCH (p. 671) records a survey of the people of Taveta, Kenya, where representatives of many tribes live. A high spleen rate and a low parasite rate in one place suggested that the common infection with *Schistosoma mansoni* might be a cause of some of the cases of enlargement of the spleen. *P. falciparum* was the common parasite, and *P. malariae* was also found, but not *P. vivax* ; the vectors are *A. gambiae* and *A. funestus*.

At Kilimane in Portuguese East Africa the spleen rate varies from 58 to 77 per cent. in children. *P. falciparum* is the common parasite and *A. funestus* and *A. gambiae* are the common vectors (REBELO, p. 231).

A malaria survey of Mauritius is reported by SIPPE and TWINING (p. 134). Malaria is largely confined to the coastal areas. The average spleen rate in children living below 600 feet was 46 per cent., and the rates were much less at higher altitudes ; in one district the rate was 90 or more. Parasite rates were similar. The intensity of malaria is greatest in those parts where signs of malnutrition are most common, and where infant mortality is highest. The vectors are *A. gambiae* and *A. funestus*, which are not very active in the cold weather.

The New Hebrides have an evil reputation for malaria, and MAUZÉ (p. 390) shows that it is the commonest disease, and that it seriously affected United States troops during the war. *P. falciparum* is the common parasite, though *P. malariae* and *P. vivax* are also found ; *A. punctulatus farauti* is the ubiquitous vector, it breeds in many kinds of water. Malaria is not found further south in the Pacific than the New Hebrides. HAIRSTON *et al.* (p. 22) found spleen rates up to 94 per cent. in children in parts of New Guinea.

The incidence of malaria in the United States continues to fall, though there are still hyperendemic areas in the south (FAUST *et al.*, p. 231). *P. malariae*

infections are quite common in children (especially coloured children) in South Carolina (McDaniel and Hemphill, p. 856).

A malaria survey of Haiti is reported by Paul and Bellerive (p. 23), who found spleen rates of 29 in the lowlands, falling to 6 in the mountains. The highest rates were in children below the age of 4. The parasite rates were much higher, most of the infections being due to *P. falciparum*. *Anopheles albimanus* is ubiquitous, and *A. grabhami* is also common.

An epidemic of malaria in Venezuela (largely *P. vivax* in one town and *P. falciparum* in the country) is described by Nieto Caicedo (p. 24). The area concerned was the basin of Lake Maracaibo, and *A. albimanus* in the desert-like regions and *A. darlingi* in the jungle country were concerned in spread.

Batista (p. 1051) has written a volume on malaria in Manaus, the capital of Amazonia, Brazil, where it is the chief endemic disease.

Piñero Garcia (p. 232) reports on malaria in Santa Fé, Argentina, where the common parasite is *P. vivax*.

Transmission

A discussion of species of *Anopheles* described in recent years is contributed by Senevet (p. 1051).

Rao (p. 233) has shown that wingless mosquitoes have a strong tendency to walk towards dark places.

Peus (p. 26) in 1942 produced a German monograph on the anophelines of the Mediterranean region.

Noyan (p. 855) shows that in Turkey the common anophelines are *A. maculipennis*, *A. sacharovi* and *A. superpictus*, with *A. claviger* and *A. sergenti* in the south. He discusses the epidemiology of malaria in the various parts of the country.

Kalandadze and Kaviladze (p. 296) report that in the western part of Iran Azerbaijan *A. maculipennis maculipennis* and *A. superpictus* are the most common vectors of malaria; *A. sacharovi* has a restricted distribution.

Buonomini and Mariani (p. 673) discuss the nomenclature of the *maculipennis* group. They distinguish 3 species—*A. maculipennis* (including race *messeae*, egg varieties *melanoon*, *fallax* and *subalpinus*, and biotype *cambournaci*); *A. labranchiae* (including race *atroparvus* and egg varieties *pergusae* and *sicaulti*); and *A. sacharovi*. They have erected a new group, *Maculipennia*, within the subgenus *Anopheles*, for these three species. Ungureanu and Shute (p. 136) have constructed a key for identification of the different varieties of *A. maculipennis* on the basis of wing scales. They consider that this group consists of at least four species rather than of varieties.

Kettle and Sellick (p. 571) show that the eggs of *A. maculipennis maculipennis* develop in 10 days at 10·6°C. and in 4 days at 16·5°C.; the eggs of *A. m. labranchiae* and *A. m. melanoon* take rather longer at these temperatures. Vuillet and Levavasseur (p. 857) have exposed eggs of *A. maculipennis* to supersonic rays, and have noticed that the rate of development was accelerated. They discuss the phenomenon.

Kettle (p. 967) has studied the growth of the larva of *A. sergenti*, especially as regards the anal papillae in water of different degrees of salinity.

de Meillon (p. 295) has published a comprehensive monograph on the anophelines of the Ethiopian Geographical Region, a most valuable work. Mattingly (p. 137) has written on the early stages of certain Ethiopian anophelines, but his paper should be read in the original. Schwetz (p. 296) has published a study of the mosquitoes (including anophelines) of the eastern part of the Belgian Congo.

In the Jebel Auliya reservoir, on the White Nile in the Sudan, Lewis (p. 968) found that *A. gambiae* is probably the main vector, but its breeding places are

well defined and can be treated with DDT in oil, or Paris green. *A. rufipes* is also probably a vector but breeds so widely that it is difficult to control. *A. pharoensis* is very prevalent but not important, and *A. funestus* is found in the south, where intensive house-spraying seems to be the feasible method of control.

Muirhead THOMSON (p. 482) has studied *A. gambiae* and *A. melas* in and around Lagos, and has tabulated the seasonal incidence. *A. melas* is found only within a mile of the shore and its abundance is determined mainly by tidal movements in the mangrove swamps. The abundance of *A. gambiae*, on the other hand, is related to rainfall, since its breeding places are open, shallow collections of water of many kinds. The sporozoite rate of *A. gambiae* is consistently higher than that of *A. melas* ; the former is relatively low when the mosquito is most plentiful, but may rise to 29 per cent. when breeding is least prolific. *A. gambiae* makes much use of houses for resting, whereas *A. melas* rests more commonly outside ; these habits have an important bearing on the usefulness of residual insecticides. Both mosquitoes feed mainly after midnight, the period of greatest activity being between 4 a.m. and dawn. The breeding areas of *A. melas* are difficult to localize and the whole area covered with *Paspalum* is suspect, but tidal swamp reclamation should eliminate all breeding.

WANSON *et al.* (p. 392) give an account of the bionomics of *A. moucheti*, which breeds round the islands in the River Congo. It is a vector of malaria, and tends to rest on entering a house, and then to feed and leave the house, to digest the meal and mature the eggs outside.

FAIN and HENRARD (p. 967) have recorded *A. moucheti* as the predominant anopheline of certain rivers in the Belgian Congo ; *A. gambiae*, *A. funestus* and *A. paludis* were also found.

GELFAND (p. 137) has found *A. rufipes* naturally infected at Kano, N. Nigeria.

On the basis of precipitin tests, Senior WHITE (p. 138) finds that the anthropophilic index of certain Indian anophelines varies very greatly in different places, and according to whether they are caught in houses or cattle sheds. This may indicate the existence of biological races of these mosquitoes. RAO (p. 137) discusses the question of gonotrophic discordance in certain Indian anophelines ; this refers to a state in which development of the ovaries does not keep pace with nutrition, but is dependent on repeated feeding. It seems probably that mosquitoes in this state, in which sexual activity is delayed, are most likely to transmit malaria because they feed more frequently than more normal mosquitoes.

Senior WHITE (p. 571) has analysed a series of night catches of anophelines in Central India, where *A. fluviatilis* is the known vector. *A. culicifacies* was found and is also probably a vector ; both of them entered houses chiefly before midnight and before dawn.

GANGULI (p. 752) has made a survey of part of the Bengal-Nagpur railway ; several species of anophelines were taken, including *A. philippinensis*, infected specimens of which were found in the malaria season.

On the north coast of Madras the chief vectors are *A. sundaicus* and *A. stephensi*. Salinity as low as 100 parts per 100,000 is the optimum for oviposition by *A. sundaicus*, but half the larval production occurs in waters having 700–1,000 parts per 100,000. These and other findings by Senior WHITE *et al.* (p. 233) suggest two races of *A. sundaicus*.

The habits of the anophelines of Malaya were studied by NAIR (p. 677) ; for details the original should be consulted. REID (p. 1052) has found two forms of *A. barbirostris* in Malaya, one of which (dark-wing) is found in the coastal plains and is a formidable vector ; the light-wing form is less important.

Epidemics of malaria occurred in Sarawak in 1946, which were due largely to intensive breeding of *A. sundaicus*, partly because low rainfall enabled

brackish water to penetrate far up the rivers, and partly because spring tides flooded an area ravaged by war. STRAHAN (p. 749) states that although *A. leucosphyrus* and *A. umbrosus* may transmit along the coast, *A. sundaicus* is responsible for the epidemic manifestations because it is so common.

In a study of the anophelines used for transmission of malaria in connexion with the investigation of mepacrine in Australia during the war, MACKERRAS and ROBERTS (p. 572) found *A. punctulatus punctulatus* the most suitable. It colonized readily and fed avidly on man; moreover, it is relatively long-lived, which, the authors think, is most important. They detail the conditions which favour the mosquito, among which they mention freedom from disturbance. WOODHILL (p. 297) gives his reasons for thinking that there are two subspecies of *A. punctulatus*, namely *A. p. punctulatus* and *A. p. farauti*, and that where these subspecies exist together there are hybrids between them. *A. koliensis*, which appears to be constant in its characters in the Solomon Islands, is not so in New Guinea, since it gives rise to both *punctulatus* and *farauti*; it also is probably a subspecies of *punctulatus*. ROBERTS and O'SULLIVAN (p. 968) have studied *A. punctulatus punctulatus* and *A. p. farauti* in New Guinea, and show that the former is more anthropophilic than the latter. After feeding, the females rest for a short time, and the application of DDT to the walls of houses is therefore a promising method of malaria control. *A. amictus hilli* in N. Queensland shows habits similar to those of the *punctulatus* group.

Quartan malaria is rare in the United States, and WEXLER *et al.* (p. 27) report a case in which infection was probably transmitted from a patient being treated with *P. malariae*, by mosquitoes breeding near the hospital, to another man in the same hospital. The need for screened wards under such circumstances is emphasized.

YOUNG and BURGESS (p. 1053) show that of 5 species of North American anophelines, *A. maculipennis freeborni* was the most, and *A. albimanus* the least susceptible to strains of *P. vivax* from certain other parts of the world. In an examination of the infectivity of local strains of malaria parasites to *A. quadrimaculatus*, YOUNG *et al.* (p. 674) in S. Carolina found that even when the gametocyte density in the blood was extremely low the mosquitoes could become infected. Patients without symptoms were as efficient as those with symptoms in infecting mosquitoes. EYLES *et al.* (p. 1052) have allowed *A. quadrimaculatus* to bite patients who have had *P. vivax* malaria, at three periods:—just before relapse, between attacks and at the end of attacks. In each case some mosquitoes became infected. Persons who have had this infection may be dangerous to the community in that they can infect mosquitoes even in the absence of clinical symptoms. From their own investigations with *A. quadrimaculatus* WEATHERSBEE and FROHNE (p. 752) do not agree with the generally expressed opinion that the density of the vector is a major factor in the transmission of malaria. They have found infected specimens when the density is exceedingly low. They have also found gland-positive females in mule-stables, and they think that, for residual DDT to be effective, it should be applied to outside harbourages as well as to human dwellings.

WILLIS (p. 674) has investigated the olfactory responses of female *A. quadrimaculatus*; if they have not had a blood meal they are attracted by the smell of the human arm, at 34°C. and 70–85 per cent. relative humidity. VOGT (p. 234) shows that the salinity tolerance of *A. quadrimaculatus* larvae may be as high as 2,900 parts per million.

Dispersal and feeding habits of *A. freeborni* were studied by ROSENSTIEL (p. 675) in California, who found that dispersal did not occur until July and was most active during September and October, up to 10 miles from the breeding places.

The technique of rearing laboratory colonies of anophelines of the western United States is dealt with by HARDMAN (p. 298) ; for details the original should be consulted. Similar papers have been contributed by BATES (p. 298) and GIGLIOLI (p. 299) ; these two authors discuss the rearing of *A. darlingi*.

FERNÁNDEZ-MELÉNDEZ (p. 138) thinks that *A. vestitipennis* may be an important vector in Cuba ; it shows marked preference for human blood.

STAGE and GILLETTE (p. 572) note that in Trinidad *A. aquasalis* may travel 5 miles from its salt-marsh breeding places. They discuss the breeding of *A. bellator* in the bromeliads of shade trees, and they have found that spraying these with 0·5 per cent. copper sulphate kills the bromeliads. Plans have been made to use shade trees which are not parasitized by bromeliads.

GIGLIOLI (p. 485) has studied the house-frequenting habits of the mosquitoes of the British Guiana coast, and shows that *A. darlingi* is the most common anopheline caught in dwellings. The domestic habits of this mosquito render the prospects of control by DDT residual house-spray excellent. FLOCH (p. 749) reports on malaria in French Guiana, where *P. falciparum* is now more common than *P. vivax* (which was not the case in 1917) ; the common anopheline is *A. darlingi*, but *A. aquasalis* and many other species are also found.

In Brazil as a whole, PINOTTI (p. 232) states that 8 species of *Anopheles* have been found naturally infected. *A. darlingi* is the most important vector, but *A. albitarsis*, *A. tarsimaculatus* [? *A. aquasalis*] and three species of *Kerteszia* (breeding in bromeliads) are also important. The subgenus *Kerteszia* in Brazil is discussed by PINOTTI *et al.* (p. 1053). COUTINHO (p. 969) describes the anophelines of Brazil, 6 species of which are vectors :—*A. darlingi*, *tarsimaculatus*, *cruzi*, *bellator*, *homunculus* and *albitarsis*. In the Amazon region of Brazil, the chief vectors are *A. darlingi* and (in coastal areas) *A. aquasalis* ; DEANE (p. 232) found that most infections were due to *P. vivax*.

PENIDO (p. 391) describes the malaria position in the region of the Rio Doce, Brazil, where *A. darlingi*, *A. albitarsis* and *A. aquasalis* are the chief vectors. The extent of the annual epidemics is determined by the extent of flooding from the river, which overflows each year ; at these times larval control is almost impossible, but it is attempted during the dry season. Chief reliance is placed on Paris green and drainage, but DDT will undoubtedly be used in future. *Anopheles darlingi* and *A. albitarsis* are the chief vectors in the valley of the Rio Doce, and *P. falciparum* was found by AMARAL and PENIDO (p. 27) in half of the positive blood slides seen in the area. In a description of the malaria history of part of Brazil, SILVA (p. 675) shows that although several anophelines are indigenous, only *A. albitarsis* was taken in houses and found to be infected.

DE LUCENA (p. 676) has found *A. tarsimaculatus* breeding in water with a relatively high salt content (up to 33 gm. per litre) over 200 kilometres from the sea in Brazil. It is closely associated with outbreaks of malaria. [*A. tarsimaculatus* is a name which has in the past included several species and varieties.]

CASTILLO (p. 750) mentions three malaria regions of Ecuador :—the west coast, vector *A. albimanus* breeding seasonally ; the inter-Andes region, vector *A. pseudopunctipennis rivadeneirai* ; the upper Amazon with its marshes, vectors *A.* (*Kerteszia*) *boliviensis* breeding in bromeliads and *A. darlingi* in marshes.

REY (p. 1053) gives an account of the known vectors of malaria in Colombia.

Malaria shows seasonal prevalence in the Cañete Valley of Peru, where the chief vector is *A. pseudopunctipennis* (ESTELA GASTELO, p. 570). The rôle of *A. punctimacula* is not yet defined. VILLALOBOS and VALDERRAMA DELGADO (p. 300) have studied the habits of *A. punctimacula* in Peru.

Aetiology

A most important advance has been made in the understanding of the development of mammalian malaria parasites in the stage between injection of sporozoites and appearance of blood forms, by the work of SHORTT, GARNHAM and MALAMOS (p. 388). These authors allowed large numbers of mosquitoes infected with *P. cynomolgi* to feed on a monkey, and in addition they then ground up the mosquitoes in heparinized plasma and injected the suspension into the peritoneal cavity and into the muscles. Seven days later the pre-erythrocytic forms of the parasite were found within the parenchymatous cells of the liver. SHORTT, GARNHAM, COVELL and SHUTE (p. 482) adopted a similar technique when they infected a human volunteer with very heavy doses of sporozoites of *P. vivax*, both by the bites of large numbers of infective mosquitoes, and by the intravenous injection of an emulsion of infected salivary glands. The volunteer had, a long time before, been infected with *P. vivax*, but after this heavy inoculation liver biopsy revealed the pre-erythrocytic forms of *P. vivax*, which were recognized in man for the first time. The details of the experiments which led to these important discoveries, and descriptions of the various stages of the parasites, are given in a later and more comprehensive paper by SHORTT and GARNHAM (p. 762). The same authors (p. 872) have shown that the exo-erythrocytic schizonts of *P. cynomolgi* may persist for 3½ months after sporozoite infection, and it is probable that this fact has a direct bearing on the occurrence of relapses.

HAWKING (p. 388) reviewed some of his own material in the light of the findings of Shortt, Garnham and Malamos, and confirmed their discovery. A more complete account of this work, with a description of the parasites is given by HAWKING *et al.* (p. 685).

YOELI (p. 966) claims to have found non-pigmented malaria parasites (resembling *P. vivax*) in bone marrow smears, together with leishmania.

BOYD and KITCHEN (p. 393) have been able to show that in three strains of *P. vivax* from the Pacific, there were substantial immunological differences between one and the other two.

CIUCA *et al.* (p. 481) observed abnormal forms of sporozoites of *P. vivax* and *P. falciparum* in 17 and 32 per cent., respectively, of *A. maculipennis atroparvus* infected on gametocyte carriers in Rumania.

CHWATT (p. 677), working in Lagos, shows that *P. falciparum* invades mature and immature red cells indiscriminately and that *P. malariae* is practically confined to mature cells. The degree of reticulocytosis varies according to parasite density; persistent sub-clinical infections in African children are accompanied by increased erythropoiesis.

SHUTE and MARYON (p. 751) have made a close study of a strain of *P. falciparum* in a patient from the Belgian Congo. Details of its peculiarities should be sought in the original, but one notable point is that attempts to infect *A. maculipennis atroparvus* in England failed.

SAUTET (p. 670) thinks that spontaneous regression of malaria in any region may be the result of a limited capacity of the strain of parasite to produce gametocytes, and illustrates his views by reference to findings in Corsica and Russia.

MACDOUGALL (p. 26) has detected chromosomes in the male gametes of *P. vivax* and *P. falciparum*.

MOSNA (p. 136) describes a method for producing flagellation of microgametocytes *in vitro*.

SAUNDERS and SCOTT (p. 135) have preserved *P. vivax* in a viable condition for as long as 37 days by freezing infected citrated blood at −75°C. and storing at −50°C.

BLACK (p. 25) has used a method of staining (which he describes) in his studies of the consumption of haemoglobin by malaria parasites.

Pathology

MAEGRAITH *et al.* (p. 234) refer to necrosis of the inner two-thirds of the hepatic lobules which they have observed in fatal malaria, and suggest that this is a result of anoxia due to reflex constriction of part of the hepatic venous system. CALEY (p. 301) discusses these findings and quotes his clinical experience in Siam, which suggested that there were hepatotoxic and encephalopathic strains of *P. falciparum*.

Experimental work with carbon tetrachloride and other substances, undertaken to help in elucidating the pathogenesis of the centrilobular liver changes found in malaria, led ANDREWS and MAEGRAITH (p. 678) to think that the necrosis is due to anoxia, possibly resulting from toxic swelling of the parenchymatous cells, which constrict the blood channels. In an exposition of the pathological processes in malaria MAEGRAITH (p. 1054) explains his conception of the part played by anoxia and circulatory disturbances. The latter may be due to reflex vascular mechanisms or to mechanical obstruction from swelling of endothelium or accumulation of cells, perhaps with local loss of fluid ; the result is local tissue anoxia. The effects of these processes vary according to the vascular and tissue structure of the organ concerned, and in the brain may lead to necrosis. The circulatory changes during a malaria paroxysm are probably of central origin, the vasomotor centres being probably stimulated by substances originating during parasitic sporulation. ANDREWS (p. 1054) shows that the liver changes in malaria (centrilobular degeneration), when they occur, are the result of tissue anoxia, and may be the result of reflex constriction of the smaller radicles of the hepatic vein. He discusses the mechanism of this constriction, and the morbid histology of the liver.

INVERNIZZI (p. 300) discusses the blood and bone marrow in the various stages of malaria.

Tests

NELSON (p. 30) found false positive serological tests for syphilis in 3 per cent. of 200 Europeans suffering from *P. falciparum* malaria in West Africa. These became negative shortly after treatment. CHINN (p. 31) also finds that false positive results are rare in malaria (less than 1 per cent. in Africans in the Congo) except perhaps in Europeans undergoing the first attack. MASSIAS (p. 1056) has never found the Hecht reaction positive in malaria without syphilis, provided that the test has been properly carried out.

ZIPF (p. 1057) shows that the Trensz photometric modification of the Henry reaction is not suitable for rapid diagnosis of malaria, though it may have a value in diagnosis and prognosis if a series of tests are performed.

DULANEY *et al.* (p. 857) show that the complement titre of the serum is usually diminished in induced malaria, and that it reflects the severity of the disease.

KLEEBERG and BIRNBAUM (p. 486) have studied liver damage in malaria by tests relating to serum proteins.

MAKARI (p. 394) has devised an intradermal test, with antigen prepared from chicken blood infected with *P. gallinaceum*, which gives a positive reaction in a high proportion of people who have had malaria, and (weakly) in only a small proportion of non-malarial control persons. The test may be useful in masked or latent malaria. The same author (p. 395) has remarked that the incidence of positive tuberculin tests is higher in patients with chronic malaria than in controls.

BROOKE and DONALDSON (p. 1056) have shown that if slides are stained in bulk, blood may, under certain conditions, be transferred from one slide to another.

ARU (p. 970) gives details of a method of concentrating malaria parasites in blood, by haemolysis and centrifugation, for the purpose of diagnosis. BERLINER *et al.* (p. 964) describe a centrifugation method of concentrating *P. vivax* in blood ; details should be sought in the original abstract.

Clinical Findings

In a long and comprehensive article, FAIRLEY (p. 20) describes the course of events in malaria induced by the bite of infected mosquitoes, as it was elucidated during the experiments made on volunteers in Australia during the war. This study of parasitaemia in the untreated volunteers and in those treated with mepacrine and other drugs depended chiefly on the evidence obtained by subinoculation of blood. The account should be read in the original.

MELLINKOFF and HIGGINS (p. 396) show that in malaria the pulse rate may range from tachycardia (as in many bacterial infections) to bradycardia (as in typhoid fever).

SOYSA (p. 395) describes the clinical features of various forms of malaria seen in the military hospitals of Ceylon.

In the Belgian Congo DUBOIS (p. 235) has found a much higher splenic index in women than in men, though there is no evidence that women suffer more than men from malaria. It is probably a question of relaxation of visceral ligaments in the erect position, and the author thinks that the splenic index in adults may therefore be misleading.

Discussing the effect of malaria on pregnancy, KULCSAR (p. 489) agrees that treatment should not be delayed if there is clinical suspicion of malaria ; mepacrine is well tolerated.

HERNBERG (p. 236) shows that *P. vivax* malaria is more benign in Finland than in more southern countries; he gives an account of the clinical course of the disease. He (p. 302) has found 4 instances of renal disturbance in 1,500 patients with benign tertian malaria in Finland [in the original abstract it was wrongly stated that they were cases of malignant tertian malaria]. In all cases the symptoms were relieved by antimalaria treatment. The same author (p. 143) has seen transitory myocardial affection in 9 of 596 patients with benign tertain malaria.

BENHAMOU *et al.* (p. 302) report a case of haemorrhagic meningitis associated with *P. vivax* infection ; the condition cleared under treatment with quinine.

Neuropsychiatric symptoms occurred in the course of malaria in the Mediterranean during the war, and in some cases *P. vivax* was incriminated, though most were due to *P. falciparum*. BOSHES (p. 396) reports a case of meningoencephalitis due to *P. vivax*.

BOYD (p. 138) reviews his experience with therapeutic *P. vivax* malaria, in relation to the development of immunity. Tolerance to the presence of parasites in the blood is the first sign of immunity, but later a strong destructive mechanism is developed, which does not seem to act on sporozoites but destroys trophozoites. The completely refractory state may last a long time and there is no evidence that it depends upon a persisting latent infection ; the immunity is not humoral.

COOPER *et al.* (p. 140) have been able to infect by intravenous injection of trophozoites, patients who had previously been infected by mosquitoes with the homologous strain of *P. vivax* but whose attacks had been suppressed by drugs, and who were in a latent period.

WHORTON *et al.* (p. 235) discuss the immunity provoked by the Chesson strain of *P. vivax*, giving details of the parasite densities at various stages.

The incubation period of the Chesson strain of *P. vivax*, in relation to the number of trophozoites or sporozoites injected, is discussed by WHORTON *et al.* (p. 139). Some of the same workers (p. 139) have shown that when the incubation period was short the relapse rate was high and the latent period before relapse was short. The types of fever induced by this strain are described (p. 140); they are not exceptional.

As a result of a study of infections induced in patients with neurosyphilis by means of several Mediterranean and Pacific strains of *P. vivax*, YOUNG *et al.* (p. 236) have noted differences between strains, in incubation periods and average parasitaemia. They quote their observations in detail, and note that Negroes in the United States were refractory to these strains.

Discussing induced malaria for the treatment of general paralysis in Holland, BYLMER and WINCKEL (p. 487) make the point that a Dutch strain of *P. vivax* tended to have a long incubation period (6–9 months), and could not, therefore, be used; the Horton (Madagascar) strain does not show this feature, but there is, nevertheless, reciprocal immunity between these two strains.

BIANCO *et al.* (p. 28) discuss relapes in *P. vivax* malaria, admitting that there are unknown factors which determine these relapses. All efforts made by the authors to precipitate relapses failed. In treatment mepacrine is better than quinine, but the best results were obtained with plasmoquine-quinine. PUTNAM *et al.* (p. 488) discuss the periodic phenomena of induced *P. vivax* infections; there seems to be a 12-day rhythm in parasitaemia and in recrudescences, for which the authors cannot account. Details should be sought in the original. A study of relapses in American servicemen returned from the Pacific and the Mediterranean was undertaken by EYLES and YOUNG (p. 859), who show that in *P. vivax* infections, parasites could usually be found some 3½ days before the febrile paroxysm of relapse, and that the median threshold count was about 3,200 per cmm. Most relapses took place within 120 days (mean 61) of the preceding clinical attack, and most patients did not show parasites between attacks.

ROSS (p. 141) gives a long account of *P. falciparum* malaria as it is seen in Europeans in Kenya. On the whole he does not agree that its manifestations are very protean except in children. Treatment is very satisfactory with quinine or mepacrine, and there is little tendency to relapse.

SCHNEIDER (p. 679) reports a case of haematemesis, apparently due to *P. falciparum* malaria. BONNE (p. 30) describes two cases of malaria in which there was severe haemorrhage from nose, stomach or bowel.

RAU (p. 858) describes a case of glycosuria in the course of malaria, caused, presumably, by an effect of the malaria infection on the islets of Langerhans. Treatment with paludrine cured the condition.

SPITLER (p. 860) reports a case of relapse of *P. malariae* infection 36 years after the original infection. BOYD (p. 395) notes that in one patient a naturally induced *P. malariae* infection has lasted more than 11 years. ROGERS (p. 143) reports a case of transfusion malaria (quartan) arising from blood which had been stored for 3 days. The donor did not give a history of malaria, but it was proved that his blood contained parasites. He had been a ship's engineer in the East.

CHEN and WU (p. 143) report transfusion malaria in China, but not if the recipients were given quinine (1·2 gm. daily) for 5–7 days after receiving the blood.

Charles Wilcocks

[*To be continued.*]

MALARIA

EKBLOM, T. Studien über die Malaria und *Anopheles* in Schweden und Finnland. [**Studies on Malaria and *Anopheles* in Sweden and Finland.**] *Acta Path. et Microb. Scandinavica.* 1945. Suppl. 59. 88 pp., 31 figs. [70 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1948, Oct., v. 36, Pt. 10, 158.]

In this detailed study of the history of malaria in Sweden and Finland, where it was widespread in the 19th century, the author discusses the factors that contributed to its appearance and spread in endemic and epidemic forms in those countries, and those that led to its virtual disappearance ; the regression began soon after 1860 in Sweden, but not until well into the present century in Finland. The malaria centres in both countries at different periods are shown on maps, from which it appears that coastal towns were more seriously affected than rural districts. In Sweden, the disease occurred chiefly in the south-east ; its distribution corresponded closely with that of its probable vector, *Anopheles maculipennis*, Mg., of which vars. *typicus*, *messeae*, Flni., and *atroparvus*, van Thiel, are present, but no correlation has been found between its transmission and any particular variety. In Finland, the disease was limited mostly to the extreme south-western coastal areas, although *A. maculipennis* also occurs much further to the north.

The spread of malaria in northern Europe in the 18th and 19th centuries is attributed mainly to the increase in trade and shipping. Since epidemics in Sweden and Finland often followed epidemics in central and southern Europe after intervals that increased with the distance northwards, it is concluded that the malaria was imported from these areas, and that the parasite concerned was probably *Plasmodium vivax*, which was the species responsible for isolated cases reported in Sweden in 1939.

The regression of malaria in Sweden and Finland is attributed mainly to the increased use of quinine and, to a lesser extent, to improved social and hygienic conditions, and not, as was suggested by Flensburg (1913), to the decline in summer temperatures that has been observed or to a decrease in the number of Anophelines. The theory that the Anopheline vectors have changed to zoophilous habits is also rejected, since an epidemic occurred in Finland in 1920–22.

HERNBERG, C. A. & TUOMELA, A. **Incubation Time of Malaria Tertiana during an Epidemic in Finland in 1945.** *Acta Med. Scandinavica.* 1948, v. 130, Suppl. 206, 534–9, 1 fig. [27 refs.]

During the war malaria was of frequent occurrence in the Finnish army but in the home districts only sporadic cases occurred. In 1945 there were 1,252 cases, of which only 85 were in the peace-time army. A more or less complete history was obtained in 868 cases. Of these 868 patients, only 12 were women. There was no case below the age of 15 or above the age of 53 ; more than one-third of the patients were in the 20–25 age group. Summer temperatures in 1945 were unfavourable for malaria transmission anywhere north of Helsingfors, but malaria cases were distributed widely throughout the country. By mid-April 142 cases had occurred ; there are no mosquitoes in Finland at that time of the year. There were 440 cases in May and 352 in June ; thereafter there was a constant decline in incidence. It is evident that the majority of the patients were not infected in 1945 ; infection by hibernating mosquitoes was most improbable in most cases, as the districts in question had been free from malaria in the previous year.

Replies were received from 596 patients as to their whereabouts in the summer of 1944 ; nearly all of them had been on military service in the Carelian Isthmus. Only 12 patients had been at home and only 5 on other fronts. Thus the majority of the patients had developed malaria after incubation periods varying from 5 to 13 months.

The authors believe that increasing light determines increased virulence of the plasmodia : in this land of short summers autumn infections are especially likely to remain quiescent till the following spring. *Norman White*

DELBOVE, P. Groupes ethniques et répartition des hématozoaires en zone d'hyperendémie palustre permanente de l'Indochine méridionale. [**Ethnic Groups and Distribution of Plasmodia in a Hyperendemic Area of Southern Indo-China.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 5/6, 358–61.

—— & CAPPONI, M. Groupes ethniques et répartition des hématozoaires en Indochine méridionale. [**Ethnic Groups and Distribution of Plasmodia in Southern Indo-China.**] *Ibid.*, 361–4, 2 figs.

Populations from the healthy deltaic region of Tonking were transported to hyperendemic malarious regions in the high plateaux of Southern Annam and in Cambodia. Conditions at the time precluded the use of prophylactic medication. Some years later the observations recorded in these papers were made. The very high degree of malaria infestation of the children of the Tonkingese immigrants did not differ significantly from that of the indigenous Moïs and Cambodian children, but there was a most remarkable difference in the prevalence of the species of *Plasmodium*. Among the indigenous children in both Annam and Cambodia, *P. falciparum*, *P. vivax* and *P. malariae* were always found in that order of frequency, *P. falciparum* greatly preponderating. In the children of the immigrant population from Tonking, *P. malariae* was always much more prevalent than *P. vivax* and in one instance more prevalent than *P. falciparum*. The indigenous and immigrant groups were living under exactly similar conditions and were exposed to attack by the same vectors, *A. minimus* in most places, *A. jeyporiensis* in others. Further research is necessary to determine whether the relative resistance to *P. malariae* is a racial characteristic of the indigenous population, acquired perhaps by prolonged exposure to infection by that species. *Norman White*

DELBOVE, P. Contribution à l'étude de l'état de prémunition antipalustre des peuplades "Moïs" du Sud Indochinois. [**Antimalarial Premunition among the Moïs of South Indo-China.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 5/6, 419–26. [12 refs.]

The resistance to malaria displayed by aboriginal Moïs in the intensely malarious high plateaux of south Indo-China has been described by FARINAUD, PROST and others [this *Bulletin*, 1940, v. 37, 289]. The present author has recently carried out an examination of 933 children and 1,209 adults of four groups of these people.

The parasite index of the children was three times as great as that of adults. Though the parasite index of adults was high in some groups the number of parasites found in positive films was comparatively very few. The splenic index of children was two to three times as high as that of adults : very large spleens were common among the children whereas the spleen rarely extended more than one or two finger-breadths below the costal margin in adults. Gametocyte carriers are much less frequent among the adults. *P. malariae* infections decrease in frequency with advancing age but *P. vivax* infections

are relatively more frequent among adults than among children. In this respect the Moïs differ from the malaria-resistant races of Central Africa and elsewhere. *P. falciparum* is the most prevalent infection of both child and adult ; mixed infections are extremely rare among adult Moïs, common among children. The acquisition of a state of premunition is costly to the Moïs ; the infant mortality rate from malaria is extremely high. *Norman White*

DELBOVE, P. *Plasmodium malariae* et prémunition antipalustre en Indochine méridionale. [*P. malariae* **and Antimalarial Premunition in Southern Indo-China.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 5/6, 356-8.

Annamites who were transported to hyperendemic malarial regions of southern Indo-China without any measures of malaria prophylaxis suffered much from *P. malariae* infection. In certain places this was the predominant type of malaria infection among them. Among the highly infected children of the indigenous populations of these same areas, *P. malariae* infections are relatively rare and always much less prevalent than *P. falciparum* and *P. vivax*. It would seem that the local Moï infant has an inherited resistance to *P. malariae*. It is interesting to note that in a study of congenital malaria in south Indo-China, *P. malariae* was more commonly found in the umbilical cord than either of the two other species of *Plasmodium*. This resistance to *P. malariae* increases with age. The examination of 2,142 individuals in four of the most unhealthy areas of south Indo-China gave the following results :—

	Number examined	Parasite index	*P. vivax*	*P. malariae*	*P. falciparum*
Children ...	933	76·8 per cent.	23 per cent.	10·2 per cent.	43·6 per cent.
Adults ...	1,209	26·6 per cent.	10 per cent.	2·4 per cent.	14·2 per cent.

At least two factors enter into this process of immunization ; an innate resistance to *P. malariae* and a state of premunition resulting from multiple and repeated malaria infections. In conditions such as these one can ignore the hypothetical intervention of a vector species specially adapted to the transmission of *P. malariae*. *Norman White*

DELBOVE, P. Recherches sur l'état de prémunition antipalustre des collectivités annamites importées en zone hyperendémique de Cochinchine. [**Antimalaria Premunition of Annamites transported to Hyperendemic Malarial Regions of Cochin-China.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 5/6, 427–33.

Lack of prophylactic drugs was responsible for a greatly increased prevalence of malaria on most of the rubber plantations of Cochin-China. The observations here recorded were made on a particularly unhealthy plantation where the regular administration of quinacrine and premaline had ceased in December 1942. The labour force concerned had come from Tonking. They were examined on four occasions between July 1943 and October 1944. The workers were divided into 3 groups according to their length of residence on the plantation at the time of the first examination : more than 5 years ; from 2 to 5 years ; from 1 to 2 years. The endemic malaria was particularly severe. The spleen index was lower in the first group than in the other two, but was above 50 per cent. on three of the four examinations. The parasite indexes showed less difference but the gametocyte index was markedly lower among workers of

more than 5 years' residence, who had developed a manifest, if slight, resistance to malaria. Very large spleens were still common among this resistant group. The prevalence of *P. vivax* and *P. malariae* in the blood of the three groups was about the same. *P. falciparum* infections were less intense in workers who had been more than 5 years on the plantation, but it remained the predominant parasite in all groups. During the observations, *P. malariae* infections were on the increase while *P. vivax* infections decreased. Mixed infections were frequent among the new arrivals, but were not seen among the group having 5 years' service.

Premunition in this part of Indo-China is difficult to acquire: acquired resistance is ephemeral and never reaches the "indifference" to infection shown by adult aboriginal Moïs. Only extremely rigorous control and social measures succeeded in averting a catastrophe on the plantation in question.

Norman White

DE MEIRA, M. T. V., SIMÕES, T. S. & NOGUEIRA, J. F. P. Observações sobre sezonismo nas Ilhas do Sal, Boa Vista e S. Nicolau (Cabo Verde). [**Malaria in the Islands of Sal, Boa Vista and S. Nicolau, Cape Verde Islands.**] *An. Inst. Med. Trop.* Lisbon. 1947, Dec., v. 4, 213–38. [15 refs.] English summary.

The authors give the results of a malaria survey carried out in three of the Cape Verde Islands during November 1946 to January 1947.

Sal is the most northerly of the eastern subgroup of islands. It covers an area of 216 square kilometres and has a population of about 1,000, two-thirds of whom are half-castes. Most of the isle is flat. Its climate is equable: the mean annual temperature is 24·79°C.; the mean annual rainfall 129 mm. About half the population lives in the capital Santa Maria. Agriculture is almost non-existent; the rainfall is deficient and the soil poor. Conditions of life are precarious; dwellings are most unsatisfactory from a sanitary point of view; scarcity of fruit and fresh vegetables engenders vitamin deficiency. Infant mortality is excessive, about 22 per cent. of the total mortality, the chief cause being enteritis. During recent years malaria cases have numbered from 31 to 75.

Of 159 children between 2 and 12 years of age, 14 had a palpable spleen. Only one of these children harboured malaria parasites, *P. vivax*. Nine adult *Anopheles gambiae* were captured in one house; the larvae of this species were found in several places, in a locality some 6 km. from Santa Maria. It was here that the patient with the positive blood smear lived.

Boa Vista forms part of the eastern sub-group of the archipelago. Its 620 square kilometres support a population of 3,000; it is the third largest isle of the group. Like the other islands, it is of volcanic origin and has 11 hills varying in height from 200 to 387 metres. Two winding streams with low banks and irregular beds allow water to stagnate in places for many months after the rains.

Malaria cases are reported each year; a severe outbreak in 1943 caused 368 cases with 11 deaths. The authors examined 349 children from 2 to 12 years of age: 50 had palpable spleens, 14·3 per cent. One of the children was infected with *P. malariae*. Search for adult and larval anophelines resulted in the capture of a single adult female *A. gambiae* in a dwelling house.

S. Nicolau is the most eastern of the northern sub-group of islands. Its 343 square kilometres have a population of 10,680. It has three mountains over 1,000 metres in height. There is considerable emigration of the population

in years of scarcity consequent upon deficient rainfall, and returning emigrants are frequently heavily infected with malaria.

The total deaths from all causes over a nine-year period were 5,996 ; of these 61 were ascribed to malaria. Years of heavy malaria incidence have generally been marked by heavy rainfall and the return of infected emigrants from the isles of Santiago, S. Tomé, and from Angola, etc.

The spleen index of 1,015 children aged 2 to 12, who had never left the island, was only 4·4 per cent. Blood examination of these children revealed no malaria parasites. One child suffering from an indigenous *P. vivax* infection was found during the survey. No adult anophelines were captured. Numerous larvae were found ; these were all *A. pretoriensis*. [See also this *Bulletin*, 1948, v. 45, 1122, 1129.] *Norman White*

HOCKING, K. S. & MACINNES, D. G. **Notes on the Bionomics of** *Anopheles gambiae* **and** *A. funestus* **in East Africa.** *Bull. Entom. Res.* 1948, Dec., v. 39, Pt. 3, 453–65, 5 figs. [10 refs.]

Short accounts are given of some investigations into the bionomics of *Anopheles gambiae* and *A. funestus* at Taveta in Kenya during November, 1944 to June, 1945.

Night collections of anophelines in huts and tents at intervals of three hours showed that out of nearly 5,000 female *A. gambiae*, more entered between 1 a.m. and 4 a.m. than at other times and that there was no entry peak at 6 a.m. as has been recorded at other places. Of about 400 female *A. funestus* the greater number entered the huts just before dawn and with this species there was evidence of an entry peak at about 6 a.m. Of 324 male anophelines, 320 were captured after 4 a.m.

Illustrations show the external abdominal appearance of anophelines in each of the five stages of ovarian development. Stage V females of both species were isolated at 25·5°C. and a diagrammatic record was kept of the changes in their external appearance after oviposition and after feeding. It was found that the mean interval between egg layings for both species was 4¾ days.

In a hut occupied by two Africans, morning sprayings and mosquito collections made at intervals of one, two and three days showed no significant difference between the sizes of the catches, and from this it is concluded that the mosquitoes did not spend more than twenty-four hours in the hut.

Anophelines were collected daily and later every fourth day from two huts. Females were grouped according to their external abdominal appearance ; this indicated that they entered the huts in approximately equal numbers each night and that there were enough of each stage either outside or in other huts to maintain these numbers in the two experimental huts.

The daily collections were then continued in the two huts but as far as possible all mosquitoes in twenty-eight other huts were killed. The collections from the two huts then showed that the numbers of anophelines in Stages I and II were maintained, while the numbers of those in the later stages were reduced ; from this it was concluded that anophelines with ovaries in Stages III, IV and V must have been resting in some of the other huts and not in the bush, and that those entering the experimental huts were either newly emerged or newly returned from egg laying.

To sum up, *A. gambiae* and *A. funestus* did not spend more than twenty-four hours in any one hut ; they moved from hut to hut and females did not rest in the bush in the daytime unless they were just emerged or just before and just after laying eggs. *H. S. Leeson*

MACAN, T. T. **Mosquitos and Malaria in the Kabaw and Kale Valleys, Burma.** *Bull. Entom. Res.* 1948, Aug., v. 39, Pt. 2, 237–68, 2 text figs. (1 map) & 2 figs. on pl. [10 refs.]

The Kabaw and Kale Valleys, latitude 23° to 25° N., lie to the east of the high mountain range separating the plains of India and Burma. They are from 4 to 10 miles wide and are bounded on the east by a range of hills that separates them from the valley of the Chindwin. The total length of the two valleys is some 250 miles; the middle 100 miles of this distance, along the road from Tamu to Kalemeyo, were alone surveyed. Population is very scarce in the Kabaw Valley and clearings are few and small. In the Kale Valley the population is denser; the whole of the centre of the valley has been cleared; rice is the main crop grown. The valleys are about 500 feet above sea level. One of the chief land routes from India to Burma runs through the two valleys. The valleys drain through a gorge in the eastern side of the valley.

June to September inclusive is the rainy season; rainfall is light at other seasons. Temperature is fairly high throughout the year. The inhabitants live in Burmese-pattern dwellings raised on poles some 6 or 7 feet above the ground.

Before the war there was very scanty knowledge regarding malaria and mosquitoes in this area. In 1942 part of the Allied forces retreated through these valleys; the spleen rates of many of these villages were then determined. In 1944, the author was in charge of a party from a Malaria Field Laboratory and remained in the valley on and off until May, 1945. Spleen rates show that the malaria risk is uniformly high throughout the valleys: only one village out of 23 examined had a spleen rate under 60 per cent. Malaria transmission takes place throughout the year and is intense from May to December inclusive.

Seventeen species of *Anopheles* were recorded. During the rains the common species were *A. minimus*, *A. leucosphyrus*, *A. philippinensis*, *A. jeyporiensis*, *A. annularis*, *A. hyrcanus*, and *A. vagus*. *A. minimus* is only locally abundant at this season and *A. leucosphyrus* is confined to the forest. When the rains cease *A. leucosphyrus* and *A. vagus* become rapidly reduced in numbers: the prevalence of *A. philippinensis*, *A. jeyporiensis*, *A. annularis*, *A. hyrcanus* and *A. barbirostris*, which breed in larger bodies of stagnant water such as rice fields, decreases more slowly. *A. minimus* and *A. maculatus* are the only common and widely distributed species in the dry season.

During the dry season, *A. minimus* is the only vector: *A. maculatus* does not appear to bite man. In September the sprozoite rate of *A. minimus* was only 0·31 per cent.: the important vector in the rainy season among troops operating in the forest appeared to be *A. leucosphyrus*: how important it is as a vector in peace-time is difficult to assess. *A. minimus* at times finds day-time shelter in the forest when this comes close to the village; night catches in houses are important in the study of the mosquito population.

Larvae identified as *A. pallidus* with the aid of standard Indian keys invariably proved to be *A. philippinensis* on emergence.

[A summary does small justice to the large amount of detailed information contained in this report.] *Norman White*

COVA-GARCIA, P. Distribución geográfica y datos bionomicos de *A. albimanus*, uno de los principales vectores de la malaria en Venezuela. [**Distribution and Bionomics of** *A. albimanus*, **a Common Vector of Malaria in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 73–85, 1 map, [13 refs.]. English summary.

In Venezuela, *A. albimanus* is distributed along the whole sea coast and the marshy edges of Lake Maracaibo. The paper contains notes on adult resting

places; it commonly rests in bedrooms. The larvae are found in waters of many types. *P. A. Buxton*

BERTI, A. L. & MONTESINOS, M. Cultivos de arroz en relación con la malaria: el problema en Venezuela. [**Rice-Growing in connexion with Malaria: the Problem in Venezuela.**] *Cuad. verde Com. ejecut. 3a. Conf. interamer. Agric.* Caracas. 1946, No. 52, 33 pp., 5 figs., 2 folding maps & 4 folding graphs. [10 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1948, Oct., v. 36, Pt. 10, 175–6.]

The history of the relation between rice cultivation and malaria is reviewed, and the relative importance of the introduction of large numbers of workers and of the various cultural methods in causing outbreaks of malaria in the neighbourhood of rice fields is discussed. In Venezuela, where rice cultivation is of considerable importance, *Anopheles albimanus*, Wied., and *A. pseudopunctipennis*, Theo., breed freely in the flooded fields. The former is one of the two chief vectors of malaria in the country and the latter is stated to be a suspected vector.

Two serious outbreaks of the disease due to Anopheline breeding in newly established rice fields recently occurred in the state of Aragua, at La Victoria in 1943 and at Caguá in 1944. The rice-fields at La Victoria were about 1¼ miles from the town, but those at Cagua practically adjoined it. In both cases, continuous flooding was used, and the vector was *A. albimanus*. Maps of both districts and graphs indicating the course of the epidemics are given, and the numbers of Anophelines taken in traps with animal bait are shown in tables and graphs. At La Victoria, the fields were first flooded in May–June; malaria broke out in the town in June and was at its height in December. No breeding places of *A. albimanus* were found in the area other than in the rice-fields; the various traps set up showed that the adults could fly for rather more than 1¼ miles from the fields and that control measures against the larva greatly diminished their numbers, particularly in the more distant traps. These measures consisted in the application to the water surface at intervals of six days of 3 per cent. Paris green in ash or road dust, which did not injure the rice. These and other anti-malaria measures were adopted in 1944, and the number of cases was much reduced.

The fields at Cagua were sown at different times and harvested throughout the year, but again the outbreak began in June, suggesting that if the crop were harvested before that month, the danger might be avoided. Other breeding places were present, but only 1 per cent. of the larvae taken were found outside the rice-fields. As no Paris green was available, a mixture of sawdust and kerosene was used against the larvae, but did not give good results.

As a consequence of the outbreaks, legislation was passed prohibiting the cultivation of rice by artificial irrigation near towns except under permit from the Division of Malariology. Permits have been issued subject to the proper levelling and preparation of the land, the use of intermittent drainage (four days flooding and four days draining) and the application of larvicides. Land that cannot be drained dry in four days may not be used for growing rice. The economic aspects of rice cultivation and the costs of epidemics and of control measures are discussed.

GÓMEZ MARCANO, A. Infección oocistica natural de los anofelinos de Venezuela. Estado actual de las investigaciones. [**Natural Oocyst Infection of Venezuelan Anophelines.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 86–92. English summary.

AMERICANO FREIRE, S. & FARIA, G. S. Criação e alguns dados sôbre a biologia do *Anopheles* (*N.*) *darlingi*. [**Rearing and some Data on the Biology of** *A. darlingi*.] *Rev. Brasileira Biol.* Rio de Janeiro. 1947, Mar., v. 7, No. 1, 57–66. [11 refs.] English summary. [Summary taken from *Rev. Applied Entom.* Ser. B. 1948, Oct., v. 36, Pt. 10, 157.]

A detailed description is given of the methods and apparatus used by the authors for rearing *Anopheles darlingi*, Root ; the cages were kept at 26–28°C. [78·8–82·4°F.], the optimum for its development in the district (in Minas Gerais) where the initial females were taken, and the relative humidity was 80–90 per cent. The most satisfactory food for the larvae was found to be dried fish, which is rich in vitamin A, and dried bread, ground and mixed in the proportion of 1 : 2, with the addition of a little brewer's yeast. This mixture was allowed to soak in tap water at 26 27°C. [78·8–80·6F.] for 4–5 days, giving an infusion with a pH of about 7–7·8 ; its other characteristics are shown in a table. The eggs were placed on water containing a little of the infusion, and a small amount of the supernatant breeding medium was replaced each day by an equal quantity of sediment from the infusion. When the larvae reached the second instar, the sediment was placed on glass plates supported by floating pieces of cork, round and on which the larvae congregated. The addition of Fleischmann's yeast was injurious. In this medium, the egg, larval and pupal stages lasted 1–2, 6 and 2 days, respectively. The cage to which the adults were transferred for pairing was about 4 ft. square and 10 ft. high and consisted mainly of wire gauze, but had the top third and the roof of wood, to provide greater shelter and darkness. The females, which survived for up to 45 days, were allowed to feed on hens and were also given the opportunity to take human blood. The eggs were laid most readily in dishes that had a dark background ; the average number deposited per female was 300–400. The adults did not survive at temperatures below 25°C. [77°F.] and, since they showed no preference for human blood, it is thought that their habit of entering houses at nightfall may be due to the falling temperature in the open, examples of which are given. Three generations were reared in the laboratory in 1945 and two, from further field-collected females, in 1946. Towards winter, in both years, the mosquitoes ceased to pair and only sterile eggs were laid, although the temperature and humidity were kept constant ; this was associated with a diminution in light intensity.

CHALMERS, T. C. Jr. **The Occurrence of Jaundice in Therapeutic and Natural Malaria.** *J. Clin. Investigation.* 1947, Nov., v. 26, No. 6, 1055–9, 1 fig. [17 refs.]

See *Bulletin of Hygiene*, 1949, v. 24, 183.

PLOYÉ. Le tétanos et les injections de quinine. [**Tetanus and Quinine Injections.**] *Rev. Paludisme et Méd. Trop.* 1948, Nov. 15, v. 6, No. 54, 267–71.

In this article the author stresses the risk of tetanus following the injection of quinine, and quotes from various writers on the subject. Mention is also made of the possibility of " syringe-transmitted " hepatitis. It is considered that mere boiling of syringes is insufficient and that these should be sterilized in an autoclave at a temperature of at least 120°C. Another author has stated that after use they should be boiled in soda solution and kept in a solution of 70 per cent. alcohol containing 5 per cent. formalin, while it is held that no solution exists which is capable of killing with certainty, in any practicable

time, spore-bearing organisms or even the virus of infective jaundice. It is admitted, however, that in the large majority of cases ordinary precautions suffice.

The following recommendations are made :—

(1) Subcutaneous injections of quinine should not be given. Intravenous injections, in dilute solution and given slowly, are quite justified in emergencies. Intramuscular injections are rarely indicated, especially, the author suggests, as absorption by this route is no quicker than by mouth. The *p*H of the solution should be close to the normal.

(2) If intramuscular quinine is given, the strictest aseptic precautions must be taken, and the injection given very slowly so as to cause the minimum amount of damage to muscle. No quinine solution should be present on the outside of the needle.

(3) It is considered most important that anyone proceeding to a tropical country where tetanus is rife should be immunized against this infection some months before departure. Even in the immunized if any wound, however slight, is incurred (and the author includes intramuscular injections of quinine) a dose of tetanus antitoxin should be given as soon as possible afterwards or even before injection. [Surely rather an elaborate precaution.]

Various theories of the endogenous origin of infections due to spore-bearing organisms are discussed.

[In the opinion of the reviewer the author exaggerates the danger of tetanus after intramuscular injections of quinine, especially if autoclaved ampoules from a reliable source are used. Syringes and needles used for this purpose should be kept separate and it is a useful precaution to dip the needle in spirit and flare it over a spirit lamp just before use.] *C. F. Shelton*

FERRO-LUZZI, G. La "Paludrine" nella terapia della malaria in Eritrea. [**Paludrine in the Treatment of Malaria in Eritrea.**] *Boll. Soc. Ital. di Med. e Igiene Trop.* (Sez. Eritrea). 1948, v. 8, Nos. 1/2, 19–30. English summary.

This paper reports the results of treating 136 patients suffering from malaria with paludrine, in Eritrea. Twenty-five patients were European, the remainder African. There were 112 *P. falciparum*, 13 *P. vivax* and 11 mixed infections. Some patients received 0·3 gm. of paludrine a day for 10 days ; others received 0·2 gm. a day for 10 days. The average duration of fever for all cases was 2·3 days, the maxima being 13 days for *P. falciparum*, 3 days for *P. vivax* and 4 days for mixed infections. The average persistence of trophozoites was *P. falciparum* 2·9 days, *P. vivax* 2 days, mixed infections 4·8 days. In two *P. falciparum* infections, trophozoites persisted for 15·5 and 11 days respectively and in another patient who had two courses of paludrine treatment the drug exhibited no schizonticidal activity at all.

Relapses occurred within 30 days from the beginning of treatment in 43 per cent. of *P. falciparum*, in 23 per cent. of *P. vivax* and in 35 per cent. of mixed infections. In 3 cases of severe pernicious malaria, paludrine failed to control the infection and death resulted. Paludrine did not appear to influence the size of the spleen.

In no case was there any evidence of drug toxicity. In his final summary, the author observes that "the above-mentioned findings show that the local strains of malaria are much more resistant to paludrine treatment in doses of 3 grammes, than the strains of New Guinea which were studied by Fairley".

Norman White

DOUCET, G. Note préliminaire sur l'emploi du S.N. 7618 en milieu malarien hyperendémique. [**Preliminary Note on the Use of S.N. 7618 (Chloroquine) in a Hyperendemic Malarial Locality.**] *Ann. Soc. Belge de Méd. Trop.* 1947, Dec. 31, v. 27, No. 4, 341–6.

These observations concern 50 school children, 6 to 7 years of age, in Léopoldville. Twenty-five were each given a single dose of 0·125 gm. of SN. 7618 (chloroquine) once a week; the remaining 25 children were untreated controls. When the experiment started on the 15th of March, the end of the rainy season, the parasite index of the treated children was 84 per cent. and of the control group 80 per cent. Eighty per cent. of the infections were *P. falciparum*, the remainder *P. malariae*; there was no *P. vivax*.

Six days after the first dose of chloroquine, the blood of the treated children was completely free from schizonts. Gametocyte carriers, however, had increased from 8 to 13. Six weeks after the commencement of treatment the blood of the treated children was completely free from parasites and remained so during the period of observation. The parasite index of the control children varied from 84 to 96 per cent. There was no absence from school on account of fever among the treated children whose general condition and intellectual activity were noticeably better than those of the control children. There was no sign of drug intolerance.

In addition a group of 30 adult Europeans each took 0·25 gm. of chloroquine once a week for six months. An examination of their blood was made once a month; no malaria parasites were found. *Norman White*

NELSON, A. A. & FITZHUGH, O. G. **Chloroquine (SN-7618)—Pathologic Changes observed in Rats which for Two Years had been fed various Proportions.** *Arch. Pathology.* 1948, Apr., v. 45, No. 4, 454–62, 7 figs.

ATCHLEY, J. A., YOUNT, E. H., HUSTED, J. R., PULLMAN, T. N., ALVING, A. S. & EICHELBERGER, Lillian. **Reactions observed during Treatment with Pentaquine, administered with Quinacrine (Atabrine), Metachloridine (SN-11,437), and with Sulfadiazine.** *J. National Malaria Soc.* 1948, June, v. 7, No. 2, 118–24, 4 figs. [11 refs.]

It has been shown that pentaquine monophosphate has less curative effect against *P. vivax* infections when administered alone than when given concurrently with quinine [this *Bulletin*, 1948, v. 45, 953]. Tests were carried out with several other antimalarial drugs to determine whether they were capable of reinforcing the action of pentaquine in like manner. None displayed activity comparable with that of quinine. During the course of the trials certain toxic reactions were encountered. These form the subject matter of this paper.

All subjects received 60 mgm. of pentaquine base (80 mgm. monophosphate) a day in six equal divided doses, for 14 days. In addition, 5 patients with malaria each received 16·8 gm. of paludrine acetate in 14 days. The toxicity of pentaquine was not thereby increased. Five patients with malaria each received 5·65 gm. of chloroquine diphosphate in 14 days: the toxicity of pentaquine was not thereby increased.

Quinacrine was given concurrently with pentaquine to 5 patients with malaria; the 4 patients who completed the treatment each received 5 gm. of quinacrine dihydrochloride in 14 days. A mild haemolytic anaemia occurred in the fifth patient; haemoglobin fell from 13 gm. per 100 cc. to 8·3 gm. on the 8th day, when treatment was discontinued.

SN-11,437 (a drug chemically related to sulphadiazine) was given concurrently with pentaquine to 5 patients with malaria: four received from 20 to 22 gm.

SN-11,437 in 14 days. The fifth had received 2 gm. when treatment was suspended. Before the onset of malaria this patient had a white blood count of 10,000 per cmm., polymorphonuclears 4,700. The total count fell to 3,700, polymorphonuclears 4,700. The total count fell to 3,700, polymorphonuclears 2,500, during clinical malaria. On the fourth day of drug administration polymorphonuclears numbered only 620 per cmm. At this point both drugs were discontinued and quinine was given to control malaria; a rapid return to normal counts followed. One other patient showed no unusual toxic symptoms during the 14-day course of treatment but later developed agranulocytosis. Seven days after discontinuance of drugs the white blood count was only 1,700; no polymorphonuclears were found. Energetic treatment for two weeks was necessary before the number of granulocytes reached normal levels.

Four volunteers without malaria were given sulphadiazine (5 gm. the first day and 4 gm. daily thereafter) concurrently with the two-week course of pentaquine and quinine. One of them developed agranulocytosis.

The concurrent administration of either paludrine or quinacrine caused a marked increase of pentaquine plasma concentrations. SN-11,437 caused a marked and sulphadiazine a moderate decrease of pentaquine plasma concentrations.

Quinacrine may increase the toxicity of pentaquine. Sulphadiazine therapy is potentially dangerous during the administration of pentaquine.

Norman White

THIODET, J. & FOURRIER, A. L'accès palustre, considéré comme un choc, peut-il être traité par des injections intradermiques de CO^2-globulines de paludéen (médication antichoc). [**The Malarial Paroxysm considered as a Shock Phenomenon; its Treatment by Intradermic Injections of CO_2-globulin of the Malaria Patient (Anti-Shock Treatment).**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1948, Nos. 26/27, 928–30.

In 1937 THIODET and RIBÈRE showed that in acute attacks of malaria the relationship of serum albumin to serum globulin underwent variations comparable to those observed in serum supersensitiveness and other anaphylactic conditions. They reported at the same time a case of malaria in which the attacks were characterized not by fever but by urticaria. In subjects sensitized by an injection of therapeutic serum, the intradermal injections of CO_2-globulin prepared from the subject's own serum produces a series of small shocks analagous to those obtained by Besredka's method of desensitization. These considerations led to the treatment of four cases of *P. vivax* malaria with intradermal injections of CO_2-globulin prepared from the patient's serum. The treatment resulted in the suppression of rigor and fever although *P. vivax* continued its normal cycle in the blood stream. All four patients improved in health and put on weight; there was also an increase in the red cell counts. If these results are confirmed, this method of treatment may prove of value in pernicious attacks of acute malaria.

Norman White

HOLZ, S. & GRANIER, M. Antimalaricos sinteticos. [**Synthetic Antimalarials.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 181–224. [74 refs.]

A detailed review.

CURD, F. H. S., HENDRY, J. A., KENNY, T. S., MURRAY, A. G. & ROSE, F. L. **Synthetic Antimalarials. Part XXVIII. An Alternative Route to N^1-Aryl-N^5-Alkyldiguanides.** *J. Chem. Soc.* 1948, Oct., 1630–36.

CROWTHER, A. F., CURD, F. H. S., RICHARDSON, D. N. & ROSE, F. L. **Synthetic Antimalarials. Part XXIX. The Preparation of some N^1-Aryl-N^3-alkyl-N^5-alkyl- and -dialkyl-diguanides.** *J. Chem. Soc.* 1948, Oct., 1636–45.

BIRTWELL, S., CURD, F. H. S., HENDRY, J. A. & ROSE, F. L. **Synthetic Antimalarials. Part XXX. Some N^1-Aryl-N^4 : N^5-Di-alkyldiguanides and Observations on the Conversion of Guanylthioureas into Diguanides.** *J. Chem. Soc.* 1948, Oct., 1645–57.

MALLIK, K. L. B. **Preventive Value of Paludrine in Malaria.** *Indian Med. Gaz.* 1948, June, v. 83, No. 6, 271–2.

The residential area occupied by the Indian staff of the Ludlow Jute Mills in the Howrah District, contains eight families and a bachelors' mess and these amount to 47 adults and 39 children. The environment is highly malarious and during 1946, there were 65 malarial attacks : only two families escaped and 26 attacks occurred among the members of the bachelors' mess and its servants [from the context it appears that " attacks " is intended to imply individual cases]. Until the middle of 1947, quinine and quinacrine [mepacrine] were used for treatment and prophylaxis ; the patients were not always regular in taking the drugs presented and relapses resulted.

In the second half of 1947, paludrine was introduced and a strict régime of prophylaxis was used. Adults and children over 10 were given 0·1 gm. twice a week and younger children had 0·05 gm. twice a week.

Those persons who had had fever within a month (mostly children) were initially treated with 0·3 gm. daily for 5 days, although they had no fever at the time.

In 1947, there was no case of malaria among the families and the only 7 cases recorded occurred in the bachelors' mess. This latter finding is attributed to the fact that the members of the mess had neglected to take the second dose when they went home at week-ends. As the number of attacks in this group of 86 people was reduced from 65 in 1946 to 7 in 1947 and the latter cases are all believed to have been due to inadequate co-operation by the persons concerned, the author considers that the results of this small series substantiate the claim of paludrine as a causal prophylactic. [The fact that paludrine was only introduced in the second half of the year must be taken into account in comparing the attacks during the whole of 1946 and the whole of 1947.] *H. J. O'D. Burke-Gaffney*

D'ARCY, T. M. W. **Malaria and the Army.** *J. Roy. Army Med. Corps.* 1948, July, v. 91, No. 1, 7–22, 2 figs. [27 refs.]

This paper consists of a statement of the policy to be adopted in the control of malaria in the Army. As such it is doubtless authentic and sets out a considered policy which is concerned with malaria surveys, destruction of adult mosquitoes, prevention of breeding, the use of prophylactic drugs, methods of personal protection and the siting of camps. It also outlines the methods of training, and the responsibilities of particular individuals in the campaign, such as Regimental Medical Officers and Hygiene Officers.

It is no reflection on the author, who has ably set out the facts, to say that the picture is disappointing and does not reflect the enormous change which has taken place in malaria control in the last three years. The use of insecticides, and those apparently only immediate ones, is restricted to a very minor place in the control of small outbreaks of malaria in which the cases are mild, anything more serious calling for malaria survey and anti-larval measures relying largely

on oil and paris green. This is admittedly to be reinforced by an adult spraying campaign, but as it is apparently to be applied weekly it is not clear whether immediate or residual insecticides are to be used, or proper value gained from them. Mepacrine is advised as a prophylactic drug and it is thought that it is still too early to form a definite opinion on the value of paludrine.

The author rightly points to the disappearance of the wartime specialist malaria control service, though he over-estimates the extent of the disappearance, and pleads for the maintenance of framework on which expansion could occur in war. *G. Macdonald*

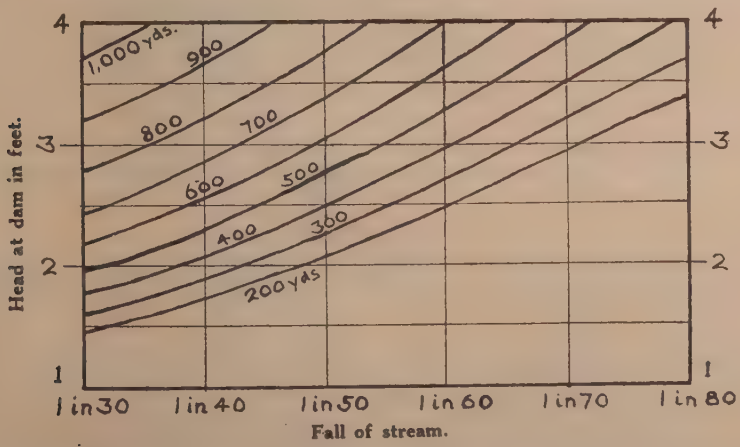
SCHULTZ, K. H. **Malaria Control carried out by U.N.R.R.A.** *Pub. Health.* Johannesburg. 1948, June, v. 12, No. 6, 173–83, 3 graphs & 6 figs.

This paper refers exclusively to work in Italy. It consists of an account of the increase of malaria following war, and an historical account of control schemes organized to combat it. The organization and methods are described and illustrated, and there are some good histograms and graphs showing the success of work in different areas. *G. Macdonald*

PETTMAN, W. E. C. **Flushing Streams as an Antimalaria Measure under Field Service Conditions.** *Indian J. Malariology.* 1947, Dec., v. 1, No. 4, 395–412, 13 figs.

This paper is of real interest as it represents the hydraulic engineer's approach to the efficacy of flushing ; not to the mechanics of siphons or sluices but to the relation between head of water, fall of stream and length of effective control. The subject has been previously studied by WORTH & SULBRAHMANYAM [this *Bulletin*, 1941, v. 38, 232], but deserves more enquiry.

The author in Assam worked with simple dams and sluices, built in streams suited as breeding places for *Anopheles minimus*, and studied the shape and velocity of the wave at different distances from its origin. He related these to the larvicidal effect of a single wave of known size and velocity, all



Showing "effective range", or distance below dam within which 95 per cent. of larvae are killed, for dams up to 4 ft. high in streams whose fall is between 1 in 30 and 1 in 80.

[Reproduced from the *Indian Journal of Malariology*.]

three factors being obtained by direct measurement, and to the entomologists' assessment that a 95 per cent. kill by each individual wave produced perfect control. In consequence he was able to work out on engineering principles and direct confirmation by observation an effective range for flushes of different characters in different streams. The essential conclusions are epitomized in the figure here reproduced.

This figure omits reference to the effect of roughness of the stream bed, partly owing to the difficulty of measuring it, and partly because it is assumed that usually it makes no great difference in the type of stream considered. Observation of individual streams is however necessary, to check that they are not grossly abnormal, before the formula can be applied.

The author rightly stresses that his observations apply only to breeding conditions for *A. minimus* in Assam. They do however supply a rational approach of value to workers with this method in all countries.

G. Macdonald

HENDERSON, J. M. **The Eradication of *Anopheles albimanus* in Puerto Rico—an Ecologic Discussion.** *Mosquito News*. 1948, June & Sept., v. 8, Nos. 2 & 3, 45–9; 97–101. [Refs. in footnotes.]

The author considers the tactics which should be adopted in a proposed effort to eradicate *Anopheles albimanus* from Porto Rico, an island of 3,534 square miles area, of equable climate, with two million inhabitants and uniformly infested with this mosquito except on the mountainous central ridge.

The problem is both administrative and technological; only the latter aspect is discussed. The mosquito can be considered difficult to eradicate because its aquatic habit is very diverse, including hoofmarks and artificial containers; its maximal flight range is great; it is more zoophilic than anthropophilic, and never uses human habitations as daytime shelters, commonly resting out-of-doors. On the other hand it does not hibernate, there is no mechanism of prolonged survival of eggs away from water as in some species, and it suffers a marked seasonal reduction from January to April which might facilitate eradication.

The mountain ridge in the island would make possible an attack on a relatively narrow front, with the sea and mountains on the flanks so that in theory a progressive drive could be carried round the island though there would be difficulties due to the passage of transport through the area of active operations. The author favours a main attack on larvae and on breeding places, with a secondary attack on adults by means of residual insecticides. There are, however, so many unknown factors to estimate that it would be best to carry out a pilot scheme on a neighbouring smaller island of Vieques where precise data could be collected.

G. Macdonald

HART, T. A., HART, Jeanelle H. & SARACHO-LOPEZ, E. **Malaria Control in Guayaramerin, Bolivia.** *Mosquito News*. 1948, Mar., v. 8, No. 1, 21–5, 7 figs.

Guayaramerin, Bolivia, is an endemic malaria area, with a hot humid climate, where the carrier has not been identified though six species of anophelines, including *A. darlingi*, are reported. Malaria control by application of paris green to water and medication of the population with atabrine [mepacrine] has in the past had poor results. DDT in oil solution was applied to all houses in 1946, at an estimated dose of 1·63 gm. per sq. metre (5·8 oz. per 1,000 sq. ft.) and a second application of " water soluble DDT " at a dosage of 4·33 gm. per sq. metre (15·3 oz. per 1,000 sq. ft.) was given later in the year. A similar

treatment was repeated in 1947. The results appear to have been excellent. In future, for reasons which are not quite clear, larvicidal treatment will be substituted.

The nature of the " water soluble DDT " is not defined. It does not appear from the context to be a suspension or emulsion. *G. Macdonald*

KOIDSUMI, K. & LIEN, Jih-Ching. **Formosan Derris as an Anopheline Larvicide.** *Chinese Rev. Trop. Med.* 1948, Jan., v. 1, No. 1, 47–58.

Derris is extensively cultivated in Formosa where it has been used for some time as an insecticide by agriculturists. During 1945, the authors investigated the value of derris as an anopheline larvicide using larvae of *Anopheles hyrcanus* var. *sinensis*. As a diluent they used either powdered rice-straw or fine dry soil dust in various proportions.

To find the most suitable size of derris particle for use on water surfaces they screened the powders and grouped them into three grades : (*a*) large particles over 0·297 mm. in diameter ; (*b*) medium particles less than 0·297 mm. ; and (*c*) small particles less than 0·177 mm. Tests of these showed that in 72 hours the largest particle killed about 85 per cent. of fourth stage larvae and only 44 per cent. of first stage larvae. The medium particle killed 94 per cent. fourth stage and 74 per cent. first stage larvae. The smallest particle killed 56 per cent. fourth stage and 100 per cent. first stage larvae. It was decided that for field use the medium grade was the most satisfactory.

Experiments were then made with this grade of derris dust to determine the lowest quantity to apply to a given surface area of water. It was found that quantities between 0·05 and 0·3 gm. derris dust per 3,300 sq. cm. of water surface gave kills ranging from 95 to 100 per cent. in 72 hours. Field experiments subsequently showed that a rate of 0·2 gm. derris per 3,300 sq. cm. of water surface was efficient.

A number of 24-hour experiments showed that toxicity to larvae was slightly greater at 18°C. than at 14°C. ; that depth of water made little difference ; that floating derris was more effective than the same quantity of powder stirred into the water and that soil dust as a diluent was satisfactory, and much less trouble than powdered rice-straw.

A warning is given that derris is toxic to fish, and that top minnows are killed if the proportion of powder to quantity of water is over 0·1 mgm. per cent. *H. S. Leeson*

HAWKING, F. & PERRY, W. L. M. **Resistance to Proguanil (Paludrine) in a Mammalian Malaria Parasite** (*Plasmodium cynomolgi*). *Lancet.* 1948, Nov. 27, 850.

Evidence has been given of acquired resistance by malarial parasites to plasmoquine (pamaquin), paludrine and quinine [this *Bulletin*, 1942, v. 39, 438 ; 1943, v. 40, 754 ; 1947, v. 44, 969, 970 ; 1948, v. 45, 158]. The present authors treated a baboon, infected by means of sporozoites of *P. cynomolgi*, with small doses of paludrine intramuscularly when the infection became patent. Partly as a result of drug treatment and the natural reactions of the host, parasites disappeared from the blood for considerable periods. Initially it was found that two daily doses of 0·03 mgm. paludrine per kilo. made the blood negative. After 14 months of repeated treatment with the small doses of the drug it was found in the case of the above animal that 23 to 30 mgm. of paludrine, which approaches the maximum tolerated dosage, failed to free its blood of parasites. The acquired resistance thus appears to be very great. The infection in two other baboons and one rhesus monkey inoculated from the

first animal behaved similarly on treatment. The authors suggest that since *P. cynomolgi* resembles *P. vivax*, a similar resistance of the latter to paludrine might reasonably be expected as a result of long treatment with the drug.

J. D. Fulton

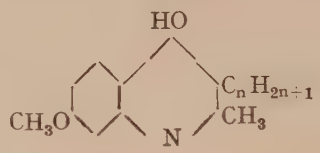
BENNISON, B. E. & COATNEY, G. R. **The Sex of the Host as a Factor in *Plasmodium gallinaceum* Infections in Young Chicks.** *Science.* 1948, Feb. 6, 147–8, 1 fig.

Male and female chicks were inoculated with blood containing *P. gallinaceum* and the resultant infections in the blood and brain endothelium were studied quantitatively in the two sexes of birds. The parasitaemia was 8 per cent. higher in the females. Invasion of the brain endothelium occurred earlier in the females ; for example, 66 per cent. of the female birds showed E. E. schizonts by the tenth day while only 43 per cent. of the males showed this type of parasite in that time. There was a difference also in response to quinine ; the average parasite density on the fourth day of infection was 7 per cent. in quininized females and 5 per cent. in the males. Three times as many females as males suffered complete therapeutic failure. These results were based on experiments on large numbers of birds and were statistically significant.

P. C. C. Garnham

KIKUTH, W. & MUDROW-REICHENOW, Lilly. Ueber kausalprophylaktisch bei Vogelmalaria wirksame Substanzen. [**Causal Prophylactic Substances in Bird Malaria.**] *Ztschr. f. Hyg. u. Infektionskr.* 1947, Jan. 6, v. 127, Nos. 1/2, 151–65.

STEPHEN, TONKIN & WALKER (*J. Chem. Soc.* 1947, 1034) prepared a number of tetrahydroacridones which showed marked prophylactic activity against *P. gallinaceum* infections of chickens. SALZER *et al.* (*Chem. Ber.* 1948, v. 81, 12) described a new series of 4-hydroxy quinaldines related to the above, of the general formula :



The substance in which n=7 was called Endochin and appeared to be the most active causal prophylactic of the series against *P. praecox* (=*relictum*) and *P. cathemerium* infections of canaries as well as against *P. gallinaceum* infections of chickens. In the canary tests definite numbers of sporozoites were injected. Treatment was started on the day before inoculation and was continued on the following six days. Endochin was the most active causal prophylactic and in the Roehl test its activity was equalled by the compound with 6 carbon atoms in the side chain at position 3 in the quinoline ring. Exflagellation of male gametocytes was prevented by members of the series, and *Haemoproteus* infections of rice finches were favourably influenced. Endochin also has a marked effect on endothelial forms in canary malaria, hence its name. Sterilization in a proportion of chronic canary infections is also claimed. It is a white powder insoluble in water and was best given in suspension *per os*, although it has been administered subcutaneously and intraperitoneally. It was rapidly eliminated and showed but little toxicity. The results in *P. gallinaceum* infections were less satisfactory than those in canaries. Whether this fact was due to marked specificity of action or to differences in absorption

in the fowl as compared with the canary was not determined. Endochin itself was not active in *P. knowlesi* infections of the rhesus monkey and failed to prevent a fatal issue. Other members of the series allowed the host to survive with a chronic infection. The drug was inactive in malignant tertian infections of man. Possible reasons for this difference in activity in bird and mammalian malaria are discussed. Various ester derivatives and a substance in which sulphur replaced oxygen in position 4 proved equally or less active than the parent. *J. D. Fulton*

TRYPANOSOMIASIS

DAVEY, T. H. **Trypanosomiasis in British West Africa.** 15 pp. 1948. London: Published for the Colonial Office by H.M. Stationery Office. [2*s*.]

The author toured British West Africa in 1945 to get precise information about trypanosomiasis in man and domestic animals for the Tsetse Fly and Trypanosomiasis Committee appointed by the Secretary of State for the Colonies; he also visited the Anglo-Egyptian Sudan, French West Africa, French Equatorial Africa, the Belgian Congo and Liberia. The aim of this report is "to give an impression of the direct and indirect effects of trypanosomiasis in West Africa, to estimate the importance of different factors in the problem and compare the methods employed in dealing with it in different localities and territories."

The extent of trypanosomiasis.

Nigeria.—About 6 million of the population of 22 million are constantly exposed to infection; 8 per cent. of 4 million examined between 1931 and 1943 were infected, and another 3 per cent. were treated at hospitals and dispensaries. In 1943 the general incidence had fallen to 2 per cent. as a result of the sleeping sickness campaign. The chief area, 106,000 square miles, lies between 8° and 12°N. There are about 5½ million zebu cattle which live in the northern tsetse-free areas, but in the dry season they come south to graze and then get infected with trypanosomes; some more resistant dwarf cattle live in the tsetse-infested parts but they are of little economic importance. Half of Nigeria has no cattle because of tsetse flies and consequently the people there lack meat and milk, agriculture suffers from lack of manure and there is no animal transport.

Gold Coast.—The population is about 4 million and about 3 million are exposed to infection, tsetse flies being present throughout the land except in the small coastal plain Sleeping sickness is serious in about 5,000 square miles of the north-east and north-west of the Northern Territories. So far as is known, the general incidence is about 1–2 per cent. but reaches 10–50 per cent. in some villages, and probably there are heavily infected villages not yet surveyed. It is one of the chief causes of mortality. The cattle, chiefly West African shorthorns, are mostly infected but show no symptoms unless resistance is diminished from some cause or other. *Glossina morsitans* exists in about one-quarter of the country and shows an infection rate with *Trypanosoma vivax* and *T. congolense* of 33 per cent. The infection rates of wild animals varied from 50 to 80 per cent.

The history of sleeping sickness, according to Dr. Morris, shows that it caused serious depopulation, driving people from the river regions to the watersheds and thus causing overpopulation and loss of soil fertility. It has been estimated that an incidence of 50 per cent. exterminates a population, 13 per cent.

rapidly depopulates, at 6 per cent. the population is stationary, and 3 per cent. allows increase. The problem of increasing the numbers of cattle and pigs is still unsolved.

Sierra Leone.—The population is about 2¼ million and there are probably less than 1,500 cases of sleeping sickness; epidemics have occurred near the French and Liberian borders, but in 1943 the incidence there was about 1 per cent. and the epidemic is under control; observation is needed as the incidence is higher in the neighbouring countries. There are about 50,000–60,000 West African shorthorn cattle which are believed to have a symptomless infection; improvement by selective breeding is therefore preferred to the introduction of outside breeds. About 5,000–6,000 are slaughtered annually. Tsetse flies occur almost everywhere and a large proportion are infected with animal trypanosomes.

The Gambia.—The area is about 4,000 square miles and the population about 250,000. No complete survey of sleeping sickness has been made but small surveys indicate an incidence of 1–6 per cent., some villages showing 25 per cent. or more. The co-operation of the French authorities is necessary to deal with the infection. The disease is mostly mild and chronic and spontaneous cures occur. Over-development of the groundnut industry is thought to have produced an increase of sleeping sickness owing to neglect of native food crops with malnutrition; cultivation of swamp rice in tsetse-infested areas is another factor.

There are about 70,000 West African shorthorn cattle; symptomless trypanosomiasis exists but many cattle are thought to die of the disease.

The author concludes that trypanosomiasis is a fundamental barrier to progress in West Africa.

Species of trypanosomes.—The author believes that *T. gambiense* is the only human trypanosome in West Africa, though atypical forms are found [see LESTER, this *Bulletin*, 1934, v. 31, 198]. *T. vivax* and *T. congolense* are much commoner in cattle than *T. brucei*; in horses and donkeys the predominant species varies from place to place, *T. brucei* being commonest in some localities; camels have *T. brucei* only and it is the commonest species in pigs though epizootics of *T. simiae* occur.

Diagnosis and Treatment.—A standard method of diagnosis (or at least of recording diagnosis) is needed. In Nigeria, the Gold Coast and Sierra Leone a house-to-house census precedes mass diagnosis; gland palpation and puncture, blood examination, and lumbar puncture are used, the procedure varying according to circumstances. The author quotes interesting figures: in Nigeria (Bauchi province) gland juice alone, 96 positive; gland juice and blood 4; blood alone 1; in the Gold Coast, gland juice 129, blood alone, 38. In Sierra Leone gland examination is mostly used but a census is not taken; in the Konna area, however, both gland juice and blood are examined as many symptomless cases occurred with trypanosomes in the blood only. Owing to staff shortage limited surveys only of animal trypanosomiasis in West Africa have been possible.

A standard treatment is suitable for unsupervised native staff; that commonly used in Nigeria, Sierra Leone and the Gambia was "three doses of Antrypol gm. 1 followed by five of tryparsamide, gm. 2, at 5-day intervals"; recently three doses of a mixture of Antrypol gm. 1, and tryparsamide gm. 2, followed by two doses of tryparsamide alone, all at 5-day intervals, has been used in Nigeria; it is shorter and seems to give better results. In the Gold Coast five doses of Antrypol, gm. 1 are ordinarily given; late-stage patients may afterwards get ten doses of tryparsamide gm. 2, or the course of tryparsamide may be preceded by one dose only of Antrypol. Other doses and combinations have been tried. Pentamidine is thought to equal Antrypol in early cases

Arsenophenylbutyric acid ("70 A") has given disappointing results in late cases in Nigeria and the Gold Coast.

For cattle trypanosomiasis antimonyl sodium tartrate has been mostly used against *T. vivax*, phenanthridinium chloride successfully against *T. congolense* and *T. vivax* and Antrypol against *T. brucei*.

Control.—Mass survey and treatment has controlled sleeping sickness in all the British West African colonies and the incidence has been reduced below 2 per cent., but less is known about cure because patients are lost sight of; early cases are cured and late cases relapse. The French Sleeping Sickness Organization stated that mass treatment had eradicated the disease in the Cameroons and a similar result is claimed for a small area of the Belgian Congo near Lake Albert where the incidence was 10 per cent. The disadvantages in British colonies are that indefinite maintenance of sleeping sickness organization is necessary, the disease is not eradicated, and the problem of animal trypanosomiasis is unsolved.

Special sleeping sickness dispensaries for treatment and local surveys are established in Nigeria, the Gold Coast and Sierra Leone; the staff are specially trained local inhabitants; in 1945 there were 40 dispensaries in Nigeria and staff were also posted to 19 Native Administration dispensaries; in the Gold Coast there are 9 sleeping sickness dispensaries but the dispensers do not travel; in Sierra Leone there are 6 sleeping sickness dispensaries and 5 rural treatment centres. In the Gambia there is no sleeping sickness service and patients are treated at the hospital and 6 Protectorate dispensaries.

Prophylaxis by drugs.—No conclusive results have been obtained in the colonies; in Nigeria Antrypol, gm. 1 was tried but violent reactions and some deaths occurred, even with lower doses, and it was given up and pentamidine has been tried since; Antrypol was also tried in the Gambia without severe reactions, and in Sierra Leone Antrypol and tryparsamide, but the results are not yet known. A carefully controlled experiment with pentamidine was made in the Belgian Congo, a dose of 3 mgm. per kgm. being used; 721 people were protected for about 8 months. Unless the infection rate is high a large number must be treated prophylactically to obtain statistically significant results. In a laboratory experiment by van Hoof in the Belgian Congo three volunteers were protected for 6 months by a dose of pentamidine of 4·5 mgm. per kgm. Van Hoof thinks that pentamidine is better than Antrypol as a prophylactic and that no cryptic infections follow its use.

Defensive clearing.—In the Gold Coast, Morris found that 500–800 yards of clearing along streams reduced *G. palpalis* and *G. tachinoides* by 60 per cent., ¾ mile by 80–95 per cent., 2–3 miles in the dry season and 5–7 miles in the rains gave 100 per cent. reduction; 800–1,000 yards was the most efficient economically. If sufficiently large, as at Anchau in Nigeria, clearing will eradicate tsetse fly in suitable areas; the cost is prohibitive in forest areas.

Aggressive clearing.—The aim is to extirpate the fly and it involves clearing all streams and rivers; it has been successfully done in the Anchau settlement in Nigeria and the Kamba valley in the Gold Coast. Cattle are also protected and since a cow needs 15 acres of grazing per annum in those countries, it is costly. A common policy of fly eradication is necessary in British and foreign West African territories.

No practical results with DDT have yet been obtained.

Organization of control in British West Africa.—The Medical Department is in sole control of sleeping sickness measures in British West Africa and the Sudan; other Departments cooperate when needed. Formerly there was a Trypanosomiasis Committee of various Departments in the Northern Territories of the Gold Coast but it last met in 1937; in Nigeria a Developmental Committee of Divisions is proposed to coordinate the work of the various Departments

concerned. Coordination and development would be best obtained by a committee of Directors of Departments which would meet at least once a year; the Governor would see that its decisions were carried out. An Inter-Colonial Sleeping Sickness Service has been proposed and the arguments for and against it are mentioned by the author, who concludes that it is inadvisable, but a British Inter-Colonial Reclamation Service is desirable.

Anglo-Egyptian Sudan.—Sleeping sickness in the southern Sudan was controlled by block clearings, concentration of people and treatment; in recent years there have been less than 100 cases a year and very few deaths. Mass surveys are made annually or more frequently, patients are treated and report periodically, and a pass system is used for visits to Uganda and the Belgian Congo. Antrypol is given prophylactically to such travellers and also to fly-boys and labourers exposed to tsetse flies. Clearings (800×20 yards) are made along streams and others around villages and watering places: these have reduced fly-movements by 75 per cent. Control measures cost £4,000 per annum. No definite Sleeping Sickness Service exists.

French West Africa.—The population in highly endemic centres is about 6 million, and 4½ million are surveyed annually; a special service of 24 European doctors, 38 *médecins auxiliaires*, and 700 attendants makes these mass surveys with treatment and has full powers over the patients. They find a mixture of Moranyl [Antrypol] and tryparsamide better than either drug alone in second-stage cases; pentamidine, 4–6 mgm. per kgm. is being tried intramuscularly and intrathecally. A case of apparently latent infection for over 4 years was seen by the author.

French Equatorial Africa.—The figures of incidence are reliable only in the Brazzaville region (about 0·5 per cent.). A Special Sleeping Sickness Service lapsed during the recent World War and the present position of diagnosis and treatment is unsatisfactory, but the incidence appears to be low (65–200 cases a year).

Belgian Congo.—No special Sleeping Sickness Service exists; the disease is endemic in almost the whole of the western and southern parts; in 1940 the incidence in about 5 million examined was 0·24 per cent. The population is surveyed and treated twice a year. Aggressive clearing has not been done, clearing being limited to watering places, fords and villages. Cattle are said to be in a state of premunition, the chief species of trypanosome being *T. uniforme*. There is an excellent laboratory at Léopoldville.

Liberia.—The area is about 43,000 square miles and the population is thought to be between 800,000 (Dr. Bequaert) and 3½ million (Liberian Government). In the western areas in 1941–43 an incidence of 14·8 per cent. was found among 100,000 persons; in 1943–44 it was about 2·2 per cent. Mass treatment was given by the Firestone Plantation Company and the American Foundation of Tropical Medicine during these periods. In 1945 a United States Public Health Service Mission arrived to work for 5 years to care for the staff of certain public works; this Mission proposes to make a health survey which will include the endemic areas of sleeping sickness. No information about sleeping sickness in other areas of the territory exists. *J. F. Corson*

NASH, T. A. M. **Tsetse Flies in British West Africa.** 77 pp., 15 folding maps & 62 figs. on 16 pls. [186 refs.] 1948. London: Published for the Colonial Office by H.M. Stationery Office. [£1 10*s*.]

This report was prepared for the Tsetse Fly and Trypanosomiasis Committee appointed by the Secretary of State for the Colonies. The author, who has a record of many years of work in Nigeria, made a ten months' tour of the four British West African Colonies and investigated all aspects of the life of tsetse

flies in relation to trypanosomiasis in man and domestic animals ; he discussed the subject with various Departmental Officers concerned—Administrative, Medical, Veterinary, Agricultural, Forestry and others, with other European residents, and with African chiefs and leading men. Much has been written about tsetse flies and trypanosomiasis in West Africa and this Report gives the views of many workers in those countries and a list of 100 publications. The author toured Nigeria from July 15th to November 3rd, 1945, the Gambia from November 7th to December 13th, 1945, Sierra Leone from December 13th, 1945 to February 20th, 1946, and the Gold Coast from February 21st to May 13th, 1946, and collected an immense amount of facts and information which he has considered under various heads such as climate, vegetation, agriculture, and trypanosomiasis of man and animals. The history of tsetse research in the colonies, the various species of tsetse flies and their distribution and habits, and the methods of control or eradication are dealt with in detail, each colony being treated separately, and finally, British West Africa is considered as a whole and in relation to neighbouring foreign territories ; suggestions for future research are offered. The Report is illustrated with 16 plates of photographs and 15 coloured maps ; the maps show the climate, vegetation, distribution of species of tsetse flies, incidence of sleeping sickness, density of population, and cattle areas. It is much too detailed to be abstracted and only some figures and other matters of interest can be mentioned in this review.

Nigeria.—Area 372,674 sq. miles ; dimensions 600 × 600 miles ; population over 20 million, averaging 55 per sq. mile. Tsetse flies extend from the coast to 12° N. (or further, along big rivers) and infest 79 per cent. of the country, the only free areas being the Bamenda highlands in the Cameroons, the Jos plateau, and the Anchau corridor. The chief endemic areas total 110,000 sq. miles (30 per cent.). Cattle cannot be kept in 104,000 sq. miles (28 per cent.) because of trypanosomiasis, but infected zebu cattle are kept in 192,000 sq. miles (51 per cent.) and uninfected zebu cattle are kept in 77,000 sq. miles (21 per cent.) of tsetse-free country in the north. It is interesting that cattle cannot be kept in the southern part of Nigeria where sleeping sickness is rare, but can be kept in the north where sleeping sickness is common.

The species of tsetse fly are *Glossina palpalis*, *G. tachinoides*, *G. morsitans* and *G. longipalpis* ; the first occupies 54 per cent. of Nigeria, the second 50 per cent. the third 9 per cent. and the fourth, so far as is known, a much smaller area in the south-west of the colony. *G. palpalis* and *G. tachinoides* live near rivers and streams and can be controlled in many areas by bush-clearing, but *G. morsitans* has a wide range and the only effective method of control is to increase the density of the population which drives away the wild game on which the fly depends for its food.

Possibly one-third of the 5 million cattle are infected with trypanosomes ; the present cattle tax yields £375,000 per annum and the Veterinary Department spends altogether £70,000 per annum ; the author suggests that the Fulani (cattle people) should be settled in reserves and that clearings be made annually to extend the grazing areas. The importance of "mechanical" transmission by other kinds of biting flies should be studied.

The vegetation in Nigeria, and in West Africa generally, changes from the coast towards the interior ; at the coast are creeks and lagoons, mangrove swamps and swamp forest, further inland evergreen forest is found, next comes a mixed deciduous forest, and then heavy woodland savannah.

Clearings were made at Sherifuri, Matyoro, Gadau (experimental) and Anchau ; in the last—the Anchau corridor—14 streams had to be cleared ; an advance gang of men with matchets cleared the undergrowth, next a gang with axes cut down the low-branching trees, and the last gang piled wood over the stumps for burning in the following year. Protective clearing at river

crossings and around villages and community clearings where the people are turned out to protect their own villages, are explained in the Report, and methods prescribed. At Rukuba, west of Jos, a suitable plan of clearing streams freed from tsetse flies 20 sq. miles with a population of 7,000 at a cost of £273. The methods of exterminating tsetse flies in Nigeria vary with the species and locality; for *G. palpalis* and *G. tachinoides* in savannah woodland, partial clearing of riverine vegetation, together with "ruthless" barrier clearing is effective, but in the forest no method of extermination is known. *G. morsitans* has never been exterminated in Nigeria but the best method would be to make controlled settlements in the area and encourage ruthless hunting of game, for which ex-soldiers might be employed; a preliminary experiment should however be made.

Suggestions for future entomological research include a study of the ecology of *G. palpalis* and *G. tachinoides* in southern Nigeria and of *G. longipalpis* and *G. caligenia*, field experiments with DDT, study of direct transmission by other biting flies, tsetse surveys, tsetse behaviour, transmissibility of trypanosomes by various species of tsetse flies, the effect of dense thicket near villages on *G. palpalis*, various experiments with partial clearing, and game destruction.

Gold Coast.—Area 91,840 sq. miles; dimensions 400 × 230 miles; population nearly 4 million averaging 43 per sq. mile, but in the Northern Territories 10 to 25 per sq. mile. Tsetse flies are present throughout almost the whole country. The chief sleeping sickness areas comprise 34,500 sq. miles or 37 per cent. of the country. The four species of tsetse flies of economic importance are *G. palpalis*, *G. tachinoides*, *G. morsitans*, and *G. longipalpis*; *G. nigrofusca* is present but little is known about it; a few specimens were caught on the northern edge of the forest. *G. palpalis* occupies about 71,000 sq. miles (77 per cent.), *G. tachinoides* 47,000 (52 per cent.), *G. morsitans* 21,000 (23 per cent.); the first two species cover between them practically the whole of the Gold Coast. The economic importance of tsetse flies cannot yet be estimated owing to lack of data.

No complete sleeping sickness survey has been made but the general incidence is low. Zebu cattle cannot be kept except in the Accra plain and the north-east corner of the Northern Territories; zebu cattle for slaughter are driven from the French territory on the north southward through the Gold Coast and by the time they reach Kumasi (Ashanti) 80 per cent. are infected with trypanosomes. There are about 226,000 dwarf cattle in the Northern Territories; they are tolerant of trypanosomiasis but very susceptible to rinderpest and anti-rinderpest vaccination lowers their resistance to trypanosomiasis. The Veterinary Department breeds zebu × dwarf cattle crosses while the Agricultural Department aims at improving the dwarf cattle by selective breeding. It is interesting that zebu cattle cannot live in the Gold Coast but can live in similar country in northern Nigeria; the difference is probably due to heavier infection of *G. morsitans* from game owing to the sparser population in the Gold Coast. The author suggests that different breeds of cattle from all parts of West Africa should be collected at Vom and subjected to infection to find the most resistant breed which would produce manure, meat and milk under exposure to tsetse flies and poor grazing conditions.

The Forestry Department and the Sleeping Sickness Service should agree about the position of forestry reserves and plantations, evergreen shelter-belts and wind-breaks. Protective clearings at river crossings and around villages have been made and two large aggressive clearings, one at Lawra in the north-west corner of the colony, the other at Pong Tamale, were made; the latter was a great achievement as it was done at a place where annual flooding of the river occurs and it freed 600 sq. miles from tsetse flies except at the height of the floods; nearly 160 miles of river were cleared and the river banks are

now bordered with grass and there is no erosion. Building low weirs or dams of earth and stone was very successful and supplied 14 villages and 3,000 cattle with water in the dry season. A drawback is that the pools cause an increase in guineaworm infection; the weirs cost from £50 to £150 each. Clearings of the Kamba river system at Lawra were "ruthless" and eradicated *G. palpalis* and *G. tachinoides* from 105 miles of stream and 600 sq. miles of country; stumping has led to erosion in some parts, and regrowth of *Mimosa asperata* in the river bed has permitted the return of *G. tachinoides*. Consolidation of the position by settling population has proved difficult, but an agricultural demonstration farm which is being set up should encourage settlement. The annual entomological expenditure in the Gold Coast is rather over £5,000.

The author comments adversely on the meteorological work; it is unreliable and there is a lack of care and interest. He suggests that a civil meteorologist with a European staff be appointed (at present it is under the Air Ministry) and that a Livingston atmometer be supplied to every station.

Suggestions for further research include: fly surveys of Togoland and the Seni and Afram plains; finding the northern line of *G. longipalpis*; tsetse distribution (in all the colonies) should be shown on maps by symbols of Fly-Boy-Hour catches, initials of collector, month and year, and a negative symbol; effect on *G. palpalis* of felling around mining camps and towns in the forest; observations with marked flies at places of personal man-fly contact such as water-holes, and also on cattle routes.

Sierra Leone.—Area 27,000 sq. miles; dimensions [160 × 160 miles ?], it extends inland for 170 miles and the greatest north to south distance is 200 miles; population over 1¾ million averaging 66 per sq. mile. The western half of the colony is flat, the eastern half mountainous except the coastal area. *G. palpalis* and *G. longipalpis* are the only important species of tsetse fly and *G. palpalis* alone transmits sleeping sickness and most of the trypanosomiasis of domestic animals; it occurs very sparsely throughout the whole country while *G. longipalpis* is found only in the extreme north, covering intermittently about 1,700 sq. miles or 6 per cent. of the country; *G. fusca* is said still to occur on the northern frontier. The rainfall is very heavy, ranging from 188 inches on the Freetown Peninsula to 89 inches at Kabala in the north, and it falls mostly in a few months.

The vegetation comprises mangrove swamps in the coastal area of creeks, primary evergreen forest, secondary evergreen forest, transition from secondary evergreen forest to grassland, and grassland and orchard bush. The mangrove swamps are probably feeding grounds only of *G. palpalis*, breeding taking place in the fringing dry ground areas. Extensive rice cultivation in some places has replaced the mangroves and fringing breeding grounds with eradication of *G. palpalis*; it is the ideal economic way of eradicating the flies but the mangroves could be left to prevent erosion. Much of the primary evergreen forest has been destroyed by native farming and although tsetse flies have been exterminated by it, the author thinks that the man-made erosion is a greater menace; the mountains are bare and the plains devastated. Secondary evergreen vegetation is also being destroyed by farming followed by too brief fallow periods; the author suggests that it should be preserved as a barrier to the spread of tsetse flies and to keep up the soil fertility. The transitional zone consists of tall grasses with blocks of evergreen shrubbery. In the northern half of the territory are grassland and orchard bush which allow farming with short fallow periods. *G. palpalis* is here found along the streams as well as along the rivers.

There are two main sleeping sickness areas: (1) Sherbro Island and (2) south-eastern Konno, Luawa and Kissi, altogether about 2,800 sq. miles or 10 per cent. of the whole country. The incidence on Sherbro Island is very low,

mostly less than 2 per cent.; the trading town of Bonthe is visited by infected Africans from the other sleeping sickness area. It is interesting that there have been 5 cases of sleeping sickness in Europeans in 4 years; they travel much by launch and may have been infected mechanically from the native crews as other biting flies swarm at times in the creeks; information on the incidence among the crews would be interesting. In the eastern area, bordering French Guinea and Liberia, incidence rates of up to 20 per cent. were found in 1940 although tsetse flies were scarce; it was quickly controlled by mass treatment and in 1945 the incidence was less than 1 per cent. The author thinks that increased rice-growing from 1942 may have helped to reduce the incidence. In 1942 cases with few symptoms but with heavy blood infection were found [see this *Bulletin*, 1948, v. 45, 410]; the author suggests that rapid mass prophylaxis at the beginning of the hot weather would reduce infection of flies from undiagnosed cases as the life of tsetse flies is shortest in the hot weather. Experimental clearing in the area should be done as a guide to the best kind of clearing to be undertaken. Clearing followed by rice cultivation might be both effective and economically valuable.

Trypanosomiasis kills horses and donkeys but few cattle; infection of cattle in the northern areas, however, may be more fatal as in one part there were, in 1942, only about 100 cattle in 900 sq. miles. Sierra Leone might become the greatest stock-raising country in West Africa; *G. morsitans* is absent and *G. longipalpis* is in a small area and unlikely to spread; dry season grazing is good; rinderpest is unknown, and there is an enormous area of grassland. On the other hand, pleuropneumonia is present but could be combated by vaccination, contagious abortion is reported to exist, and only certain tribes (5·6 per cent. of the population) keep cattle. In 1942–3 there were about 45,000 cattle.

The policy of the Agricultural Department is to encourage swamp rice growing and discourage upland rice growing and this would allow longer fallow periods and lead to decrease in the numbers of tsetse flies. The Forestry Department wish to increase the forest reserves by cultivation of trees in the uplands; cash tree crops such as timber, cocoa, oil palm, cola and rubber can be grown.

The author's suggestions for future entomological research include an inquiry into the effect of wet mud on pupae, the life history of tsetse and rates of infection, the influence of pig-keeping, and surveys of the distribution of *G. longipalpis*.

The Gambia.—Area 4,130 sq. miles; dimensions about 300 miles long by an average width of 6 miles; it extends along both banks of the River Gambia. It lies in north latitude 13·30, which is about that of the northern boundary of Nigeria and has a similar climate and vegetation. Population 220,000 with average density of 53 per sq. mile, but if 21,000 in Bathurst are omitted the density is 48 per sq. mile. Tsetse flies—*G. morsitans* or *G. palpalis* or both—are present throughout, the former confined to the sandstone plateau country and the latter to the river and creeks, and each species should be considered separately. The author thinks that there are no *G. tachinoides*, but *G. longipalpis* may be present in the South Bank Province. Two oil palm forests near the mouth of the river also harbour *G. palpalis*. The people mostly live away from the tsetse-infested river banks and have excellent wells; cattle can be kept in all the provinces. *G. morsitans* is present throughout the north bank (probably) but on the south bank there are two stretches where it has not been found, one in the lower part [50 miles ?] and the other for about 45 miles near the eastern end. No entomological survey has been made since 1911.

Mangroves extend up the river for 160 miles, then there is a swamp forest for 34 miles and finally 105 miles of river with high banks; in the dry season sea water penetrates up the river for 160 miles to Ka'ur. The Nigerian partial clearing technique would almost certainly succeed in eliminating *G. palpalis*, but attempts to eliminate *G. morsitans* by clearing would be a waste of money;

much of the higher land is uncultivatable so *G. morsitans* could not be dealt with by increasing the density of the population. There are few antelopes and *G. morsitans* probably feeds chiefly on baboons. The author distinguishes "close personal" and "close impersonal" contact between man and tsetse fly; the former occurs at village water-holes where the same people are repeatedly exposed to bites, the latter on the river (*G. palpalis*) and roads (*G. morsitans*) where exposure is more casual and the flies feed on many kinds of hosts. In the Gambia contact is impersonal as the people use wells except in the creeks.

There are about 70,000 cattle of two kinds; true West African shorthorn dwarf, and crosses of these with N'dama descendants of the Hamatic longhorn; both are very resistant to trypanosomiasis but not to rinderpest. A cross, with zebu cattle, is called Gobira and is more resistant to rinderpest. The common trypanosomes are *T. congolense* and *T. vivax*, *T. brucei* being rare; calves often recover spontaneously. The cattle live exposed to *G. morsitans* but if the flies feed mostly on baboons, they will not be heavily infected; in the Niumi area cattle do badly probably because there is more game there and the flies would be more heavily infected. Since the anti-rinderpest campaign began cattle have increased from 35,000 to 70,000.

The author's suggestions for future research include: fly surveys of eastern Niumi and the high-banked reaches of the upper river; feeding of *G. morsitans* on baboons; a sleeping sickness survey of the Gambia to determine the relative importance of the two species of tsetse fly and for plans to be made to deal with the worst areas.

West Africa.—In a general summary the author has included on two maps of West Africa the latest data for the French and Portuguese colonies; he notes that the French map (*Carte de Répartition des Glossines et d'installation des Chantiers Prophyluxie Agronomique*, 1942) differs considerably from earlier maps and mentions the chief differences.

Where the West African coast line is at right-angles to the south-west monsoon (French Guinea to Liberia; west Gold Coast and Nigeria) the rainfall is heavy on the coast and decreases steadily inland until near the desert there are eight dry months and less than 30 inches of rain; but where the coast lies parallel with the south-west monsoon the dry conditions of the interior extend to the sea where, however, the humidity is greater than in the interior. The length of the dry season increases on going northward along the Atlantic seaboard.

The author summarizes for West Africa the various aspects dealt with in the individual colonies. In his general conclusions he states that "the whole subject of man-fly contact needs investigation by a team of doctors, entomologists and statisticians"; other conclusions are that study of the effect on tsetse of altering the plant succession should be made by large-scale field experiments, and the effect on cattle of a certain amount of game destruction in an area without attempting tsetse eradication should be investigated.

J. F. Corson.

NASH, T. A. M. **The Anchau Rural Development and Settlement Scheme.** 22 pp., 10 figs. (3 folding) & 16 figs. on 4 pls. 1948. London: Published for the Colonial Office by H. M. Stationery Office. [3*s.* 6*d.*]

The Anchau Settlement is an area of 712 square miles in the form of a corridor 70 miles long by about 10 miles wide, situated in the eastern part of Zaria Province of Nigeria and extending in a south-easterly direction from the Kano-Zaria section of the main railway; it is traversed throughout its length by the River Galma and along its south-western side runs the Zaria-Jos railway, a few miles away but touching the corridor at two points. The corridor lies in

four Districts of Zaria Province—eastern Makarfi, Ikara, Anchau, and Kudaru from north-west to south-east. It was chosen as an area to be freed from tsetse flies and developed as a settlement.

The Settlement Scheme arose from the need to deal with a high incidence of sleeping sickness causing a serious mortality, and the opportunity was taken to improve hygiene, living and working conditions, and social amenities without attempting to alter the habits and daily life of the people. This area was chosen after much preliminary investigation, including a census of the people, entomological, vegetational and agricultural surveys, and estimates of the requirements and supplies of water, fuel and other needs.

The seriousness of sleeping sickness was observed in 1934 and in 1936 the author suggested the choice of the Anchau corridor as it had good communications and the eradication of the tsetse flies seemed to be possible. The Scheme was approved by the Secretary of State for the Colonies and a sum of £95,000 was granted from the Colonial Development Fund on condition that economic development should be an essential feature; it was to be spent in five years but the World War caused an extension to ten years. The work was carried out by the Sleeping Sickness Service, directed by Dr. H. M. O. Lester, and the author was the senior entomologist on the Staff.

People living in adjacent areas were moved into the corridor to increase the population enough (to 70 per square mile) to maintain the bush-clearing by re-slashing along the streams. The only species of tsetse flies present were *Glossina palpalis* and *G. tachinoides* which keep near the streams, and the bush-clearing was therefore less difficult than if *G. morsitans* had been present. High trees were not felled except at the end of the clearings where complete "ruthless" clearing for a mile of stream, as the crow flies, was necessary to prevent tsetse flies from re-entering during the rainy season. Details of the clearing are given in the author's paper "Tsetse Flies in British West Africa", 1948, H.M.S.O. [above].

The preliminary work was begun in October, 1937, and the building of new villages and hamlets began in 1939; the people built the huts they were used to, but to a standard plan of blocks of compounds separated by fire-breaks around a central well which was 80 yards distant from the nearest pit latrine. Each compound was 100 feet square (or 100 × 50 feet) and contained on the average 7·5 persons; each block was separated from others by a fire-break of 125 feet (diagrams of a village of 60 compounds and of a compound of 11 huts are given). Huts were 12 feet across and 12 feet from the nearest neighbouring huts. Pit-latrines were made in the compounds.

Wells, of standard pattern, were 4 feet across, cement-lined, and the mouth had a cement collar 2 feet high with a bevelled edge and wooden rollers to facilitate drawing; the water was poured from the bucket into cement basins from which it ran through pipes into the people's water-vessels, A special cement apron with a drain prevented too much mud from forming around the well. By September, 1945, there were 126 standard wells in the corridor. Old insanitary wells were filled in or converted into pit-latrines, and "purdah" wells in the compounds had a simple cement top fixed for which the owner paid 10s.

Fuel.—The average consumption of wood-fuel per head was 15 cwt. ($\frac{3}{4}$ cord) per annum; one acre of the local wooded country would supply 17 persons for a year, so 12 acres would be needed for a 12-year cutting rotation.

Takalafiya ("walk in health") is the name of a new town built about a mile from the town of Anchau and into which some 1,000 of the inhabitants of the old town of Anchau were moved; it is the centre of local government and has a dispensary, school, mosque, court-house and prison. There is a new market with 14 stalls and a slaughter-slab and two wells; also an animal clinic, a clarified-butter-fat unit, and a hide-drying enclosure. The roads are 100 feet

wide and are planted with avenues of mango, fig, and Cassia trees. The attendance on market-day was over 7,000.

Other improvements effected were : hygienic improvements in the old town of Anchau and other small towns ; issue of 18,500 fruit trees, introduction of new crops for trial, issue of ploughs and ploughing oxen ; a rinderpest immunization camp ; pig-keeping, breeding of horses and donkeys and of good strains of goats and poultry were encouraged. Communal forestry areas and forest reserves were established, elementary and village schools were set up, where reading in Hausa and the Mohammedan religion were taught.

Anti-tsetse stream-clearing.—By April, 1945, tsetse flies had been eradicated from 610 square miles by clearing 540 linear miles of stream, and 50,000 people lived in fly-free country.

Costs.—Huts, 21s. each ; wells, £40 each (37 feet deep) ; market stalls, £40 each ; slaughter slab, £40 ; clearing (540 miles) £11 per mile for 450 miles, when wages were 4d. per day.

Future prospects.—The Native Authority needs training and could not yet take over the management of the area from the Europeans ; without continuous supervision it would relapse, so the Sleeping Sickness Service should continue in control until a full-time District Officer can be appointed. The author makes useful suggestions for similar projects from the lessons learnt in this one, one being that an aeroplane should be used in surveying.

The Anchau Scheme has been the subject of previous papers [this *Bulletin*, 1939, v. 36, 672, 736 ; 1942, v. 39, 241 ; 1945, v. 42, 788 ; 1946, v. 43, 1022 ; 1947, v. 44, 971], but this is the first detailed account of the work done during the eight years from 1937 to 1945 and it will be very useful as well as interesting to all who are engaged in combating trypanosomiasis not only in man but also in domestic animals, which is regarded by some as the more important disease. Excellent photographs, plans and maps illustrate the paper. *J. F. Corson*

BUXTON, P. A. **Trypanosomiasis in Eastern Africa, 1947.** 44 pp. 1948. London : Published for the Colonial Office by H.M. Stationery Office. [3*s.*]

This comprehensive report to the Tsetse Fly and Trypanosomiasis Committee in London is based on the author's visits in 1945 and 1946 to nearly all the African countries where trypanosomiasis is transmitted by tsetse flies ; he attended conferences, visited and had discussions with various workers and inspected many areas where control of trypanosomiasis and tsetse flies, and reclamation of land for settlement, farming and grazing, had been carried out. The subject is so large and has so many aspects that it was necessary to select the most important and less well-established matters with special reference to work now being carried on. The report is both appreciative and critical of past and present work and several important recommendations are made. The need for more intercourse between workers through conferences, committees, exchange of visits and other forms of communication and discussion is strongly emphasized [work on trypanosomiasis has been greatly hampered by two World Wars and a period of world-wide financial depression].

The author groups his observations under the following heads : Current Problems and Research ; Methods of Reclamation from Tsetse ; Results of Reclamation ; Organization of Research and Reclamation ; and concludes with a four-page Summary. The whole subject is dealt with in considerable detail under subheads but the author has naturally had to select the more interesting and important features and matters which have not been sufficiently

appreciated. Some of these are given here though necessarily in a condensed and somewhat disconnected form.

Entomological Problems and Research.—The Tsetse Committee should prepare a uniform map for Eastern Africa on a scale of 1/4,000,000 within the next two years. The nomenclature of plant associations and types of woody vegetation needs revision and standardization. It would be useful to know whether advance of tsetse flies follows an increase in their numbers; it should be remembered that advances are more noticeable than retreats and that both have no doubt occurred. Referring to the cost of the work at Shinyanga (Tanganyika Territory) during the last 25 years, the author points out that reclamation of land is not the only benefit obtained; a great deal of knowledge of tsetse flies has been acquired which will be a valuable foundation for future work. More attention should be given by entomologists to the transmission of trypanosomes by tsetse flies. An important question is whether the association of tsetse flies with certain types of vegetation depends on their perception of climatic conditions or on the smell and appearance of the vegetation. A young scientist with special knowledge of insect behaviour should visit Africa to study the question for 3 years. Direct or mechanical transmission of trypanosomes by tsetse flies and other blood-sucking flies needs further study; the authorities of the British Museum (Natural History) should be asked to compile a monograph on the Tabanidae. The precipitin test is useful to determine on which animals tsetse flies feed, but standard sera should be prepared in a large serological institute in Europe to ensure accuracy. Nocturnal feeding by tsetse flies should be investigated by means of an infra-red projector and viewer. The physiology of digestion in tsetse flies needs further study; it is remarkable that usually only a small percentage of flies which have fed on blood containing trypanosomes become infected [the case of the "mongi" reedbuck which may infect at least 60 per cent. of surviving flies is an interesting exception] and this should be investigated, as well as the influence of temperature on the speed of development of the trypanosomes in the flies.

Protozoal Problems and Research.—Interesting work on the morphology of trypanosomes has again raised the question of sexual differentiation and multiplication of trypanosomes; the author thinks that recent work "tends to emphasize the distinctness of *T. rhodesiense* and *T. brucei*."

Problems and Research in Human Medicine.—The importance of human trypanosomiasis may be estimated to some extent by the incidence and mortality; in Kenya, Uganda and Tanganyika Territory less than 2,000 cases and about 300 deaths a year are notified, and about 100 cases with 10–20 deaths a year in Northern and Southern Rhodesia, Nyasaland and Ngamiland. These numbers are small though there is, of course, always the possibility of an epidemic occurring. An interesting fact in epidemiology is the existence of healthy human carriers of trypanosomes. Another subject that has been much discussed is the animal reservoir of human trypanosomes, especially the wild animal reservoir. The author notes that it has been recommended that a medical man should concentrate on the epidemiology of sleeping sickness and make suggestions regarding it; survey of large areas, and intensive work in a small selected area should be undertaken, the latter being an area where mild Gambian sleeping sickness occurs and this should be observed for a long period without the use of curative drugs to see whether spontaneous recovery takes place [is there not some risk to life?]. The author thinks that persons exposed to special risk of infection should receive prophylactic injections of antrypol, 1 gm. every 3 months. [The reviewer would prefer the greater risk of getting an unmodified infection to the lesser risk of getting a masked infection.]

Problems and Research in Veterinary Medicine.—There are said to be about 14 million cattle and about 15 million people in the East African Colonies; the

author thinks that it is most important to increase the number of healthy cattle by increasing safe grazing areas and water supplies. He repeats his recommendation, in a previous report in 1945, that a veterinary scientist should visit East Africa and report on the subject of trypanosomiasis in cattle there. The question of direct transmission by other biting flies is especially important in animal trypanosomiasis. More attention should be given to immunity.

Problems and Research in Chemotherapy.—Recent work is briefly reviewed.

Methods of Reclamation from Tsetse.—These include insecticides, repellents, traps and parasites of tsetse pupae, measures against game, measures against particular types of vegetation, and measures based on human settlement. It is fairly easy to destroy over 95 per cent. of tsetse in an area but extremely difficult to destroy all. The new insecticides, DDT and gammexane, are useful for small problems rather than for large areas; in the Mkuzi game reserve of Zululand an area of 35 square miles was sprayed from an aeroplane three times in December 1945 and January 1946; the spray contained pure DDT 5 per cent. in furnace oil 90 per cent. and kerosene 10 per cent., and 0·6 gallon per acre was used from a height of 50 feet, the aeroplane flying across a wind of 10–15 miles per hour and spraying swathes 70 yards wide. The fluid alone cost £10,500 or 10s. per acre. The number of flies (chiefly *G. pallidipes*) was reduced by over 90 per cent. As the spray failed to penetrate thickets, a smoke made by sublimation of DDT concentrates in the exhaust of the aircraft was tried later during full leaf in the same area and gave promising results, but it cost about 13s. per acre for DDT alone. Other experiments with DDT and gammexane are being carried out in Tanganyika Territory and Uganda. Repellents are of little use. Trapping is useful chiefly in "de-flying houses" across roads for people and vehicles. Trains present so far an insoluble problem.

Destruction of game and limitation of their movements.—This is an old subject but is so misunderstood that the author discusses it at some length. Elimination of *G. morsitans* by game destruction has been effected in several areas in East and West Africa and a large experiment in an area of about 700 square miles is being made at Shinyanga. The work in Southern Rhodesia has been very successful and was shown to the author on his visit; some 6,000 square miles have been cleared of *G. morsitans* and 4,000 square miles are nearly clear. A general account of this work should be drawn up for the information of the public. The elimination of *G. pallidipes* is more difficult as it feeds more on smaller animals, while *G. palpalis* and *G. tachinoides* feed also on reptiles. It must be remembered that wild ungulates also suffer from many cattle pests and cattle diseases and destroy crops. The author criticizes Article 10 of the Convention relative to the Preservation of Fauna and Flora in their natural State, signed in London by the representatives of many of the Powers, in November 1933, which prohibits trapping of wild animals; it is unfair to the African farmer and herdsman. The shooting of game for protection from trypanosomiasis must be planned and carried out skilfully under the control of the Game Department. Other means of control of game are fencing and the establishment of game reserves, which also call for expert knowledge.

Attack on vegetation.—Various methods of clearing are used according to local conditions; the sleeping sickness settlements in Tanganyika are a success as are also those done by the Tsetse Research Department, such as the Huru-Huru and Ukerewe peninsula clearings in Tanganyika Territory. "Rod clearing" and "block clearing" along rivers are effective against *G. palpalis*; clearings to act as barriers against the advance of *G. morsitans* need to be well planned and maintained on a large scale. "Discriminative clearing" in "hard-pan" areas has been successful.

Human settlement.—Evacuation of population is justified in certain areas but it is usually better to hold the land and advance into the fly-bush ; this the African farmer does with administrative, agricultural and medical help. Much of the land is poor both for grazing and growing crops, and the problem of settling enough people (*e.g.* 1,000 families in 25 square miles) without exhausting the soil is difficult. The author concludes that the agriculturalists must have the last word on this provided their views are well-founded.

Results of Reclamation.—The large area of land successfully reclaimed is impressive. In Southern Rhodesia sleeping sickness is localized and rare and the aim has been to protect cattle ; in the European areas the Government plans to make 300–350 farms of 3,000 acres each and about 80 farms are now occupied and 210 more (1,000 square miles) are surveyed and cut out. In four native reserves (Kandeya, Chiswiti, Urungwe and Shangani) with a total area of 4,000 square miles, the population increased between 1940 and 1946 by 73 per cent. and the cattle by 60 per cent. A fifth reserve, Sanyati, is being opened up for settlement. The operations have cost £176,000 since 1925, which is less than £18 per square mile or about 6d. per acre. In Tanganyika Territory there are sleeping sickness settlements made by the Medical Department and reclamation areas by the Tsetse Research Department ; the former contain about 190,000 people while the latter comprise about 900 square miles now occupied by man and cattle and there are another 400 square miles previously reclaimed by Swynnerton twenty years ago. Population and cattle have increased greatly and are much less crowded.

Organization of Research and Reclamation.—The author presented a report on this subject in 1945 ; in it he made the following recommendations : better co-ordination of research, regional planning of research in East Africa, and the founding of an East African Institute for Research on Tsetse Fly and Trypanosomiasis ; a veterinary scientist with knowledge of animal trypanosomiasis should tour East Africa and report on trypanosomiasis in stock ; research on tsetse flies and reclamation should be separated ; a Tsetse Reclamation Service with an inter-territorial director and staff should be established. This report was accepted by the Tsetse Fly and Trypanosomiasis Committee in London and by the East African Governors. The author now considers that the same principles are applicable to Central Africa. A Tsetse and Trypanosomiasis Committee for a colony should include the heads of the Departments concerned (Administrative, Health, Veterinary, Forestry, Agriculture, etc.) and technical officers ; it should include also a member of the East African Reclamation Service and of the staff of the Research Institute. Such committees now exist in Kenya, Uganda, Tanganyika Territory, Northern Rhodesia, Bechuanaland and Nyasaland, and there is a similar one in Southern Rhodesia. These Committees should continue to meet regularly. Recently the Governors' Conferences of both East and Central Africa have set up committees to deal with tsetse and trypanosomiasis. The author discusses the formation of one standing committee for Eastern Africa ; at least one member of the Central Africa Committee should attend every meeting of the East African Committee. An international African Conference should meet every three years where the work is being done and not in a capital city. Scientists should visit other territories as part of their duties. Communication between the East and Central African Committees and neighbouring countries should be kept up by invitations to attend conferences and by the circulation of papers. More entomologists, protozoologists, forest-botanists and others are needed in British African Colonies and the Union of South Africa.

[This excellent report will be studied with great interest by all who are connected with the campaign against trypanosomiasis and concerned with the progress of the countries affected.] *J. F. Corson*

PROC. ROY. SOC. MED. 1948, Aug., v. 41, No. 8, 551–8 (Sect. of Comp. Med. 23–30). **Discussion: The Epidemiology of Trypanosomiasis in Man and Animals** [CARMICHAEL, J.; HOARE, C. A.; EDWARDS, J.T.; BOYD, J. S. K.; LOURIE, E. M.; HAWKING, F.; LEROUX, P. L.]

A combined meeting of the Section of Comparative Medicine (Royal Society of Medicine) and the Royal Society of Tropical Medicine and Hygiene was devoted to a discussion of the epidemiology of human and animal trypanosomiasis.

Dr. J. CARMICHAEL pointed out that the mammalian trypanosomes could be divided into 2 groups: those transmitted by tsetse flies and those transmitted by other biting insects, especially by Tabanids which act as vectors of *T. equinum* and *T. vivax* in South America, and of surra in the Old World. The epidemiology of trypanosomiases is correlated with the bionomics of their insect vectors. In Africa the most common vectors are the riverine species, *Glossina palpalis* and *G. tachinoides*, and the savannah and bush species, *G. morsitans* and *G. swynnertoni*, while *G. brevipalpis*, *G. longipennis* and *G. austeni* are of local importance. As a rule domestic animals do not survive in areas infested with the bush species of tsetse but cattle can exist in riverine and lake areas. This is due to the fact that the most pathogenic parasite, *T. congolense*, is not transmitted by *G. palpalis*, while *T. vivax* and *T. brucei*, which are transmitted by this fly, do not cause severe disease in animals kept in good condition. In this connexion it is pointed out that drug treatment of cattle in fly-infested localities is of little value, owing to constant reinfection. Serious complications in the epidemiology of trypanosomiases are introduced by the shifting of the tsetse population. Thus, in Uganda there is evidence of extension of the flies into areas hitherto free of them, leading to the extermination of cattle. Big game, especially buffalo and antelopes, serve as carriers of pathogenic trypanosomes of domestic animals; they also introduce tsetse flies into fresh country. In this way the disease becomes permanently established among cattle in new areas. Conversely, the elimination of game is followed by the disappearance of trypanosomiasis from the locality.

Chronic trypanosomiasis in cattle is frequently associated with transmission by biting Diptera other than tsetse. It may be acquired in the first instance from tsetse, when the animals are temporarily in contact with this fly, or it may be transmitted entirely by mechanical vectors, represented by stable-flies and horse-flies, as in the case of *T. congolense*.

Dr. C. A. HOARE dealt with the reservoir hosts of human trypanosomiasis. He pointed out that in Africa the tsetse flies and wild game represented a common pool for the pathogenic trypanosomes affecting man and domestic animals. In the case of trypanosomes of the *brucei* group the specific identity of the parasite in natural infections can only be established by experimental infections, but it is usually determined from epidemiological evidence. It has been demonstrated that *T. rhodesiense* and *T. gambiense* can be maintained by cyclical transmission through wild and domestic mammals for several years, without losing their transmissibility to man. From these experiments and from observations in naturally infected animals it is concluded that in sleeping sickness, in addition to man, other mammals constitute a source of infection. In the case of the Rhodesian disease antelopes represent important reservoir hosts even in localities which have been depopulated, but in the case of the Gambian disease man is the essential host, though certain domestic mammals can be regarded as potential reservoirs.

The relationship of *T. brucei* to the human trypanosomes has a direct bearing on the question of reservoir hosts. Though there is no evidence that *T. brucei* can readily adapt itself to man under normal conditions, there are reasons to

believe that this transformation has actually taken place in the past and might occasionally recur under exceptionally favourable conditions.

In the case of Chagas's disease the rôle of lower mammals as reservoir hosts is much clearer. American human trypanosomiasis is a typical zoonosis, *i.e.* primarily an infection of wild animals (such as armadillos) from which the disease is occasionally spread to man by Triatomid bugs introduced into human dwellings. Once established in a community the infection is transmitted to man by domesticated bugs. Furthermore, domestic mammals, like cats and dogs, also acquire the infection and serve as reservoir hosts. The position in the United States is peculiar, for human trypanosomiasis has not hitherto been recorded there, though local wild rats and Triatomid bugs harbour *T. cruzi*, which is infective to man under experimental conditions.

Dr. J. T. Edwards drew attention to the peculiarities of the veterinary aspects of trypanosomiases, which were caused by trypanosomes belonging to three groups (*brucei*, *congolense*, *vivax*), differing in their morphology, development and antigenic constitution, as well as in response to drug treatment. In the case of infections with *T. evansi*, there was a difference in the response of various species of domestic animals to therapeutic and preventive treatment, especially with Naganol. While in horses only large doses of this drug were effective, in the case of bovines smaller doses of simpler remedies produced the desired effect. Dogs and camels occupied an intermediate position with regard to response to chemotherapy.

Dr. Edwards then turned to the inter-relationship of trypanosomes of the *brucei* group. Indirect proof of their close affinity is provided by the successful employment of antigens prepared from *T. brucei* and *T. evansi* in the complement fixation test for Dourine. As regards the possible adaptation of *T. brucei* to man, a parallel is provided by *T. equiperdum*. This species is usually not transmissible to rats but some strains are infective to and can be passaged through a series of these animals, in which the course of infection is indistinguishable from that caused by *T. brucei* and *T. evansi*.

Brig. J. S. K. Boyd thought that the prospects of discovering a drug conferring protection against *T. congolense* infection were promising, especially in view of the encouraging results obtained with phenanthridinium. This view was supported by Dr. E. M. Lourie, who also remarked that the interpretation of many epidemiological problems in trypanosomiasis suffers from a tendency to regard the characters of the trypanosomes as being fixed. Actually it was possible to enhance the virulence of *T. gambiense* to that of *T. brucei* by passage through suckling rats. It has also been shown that the virulence of *T. rhodesiense* for man is considerably reduced after prolonged passages through sheep. In the light of these facts it is possible that strains, which at the beginning of this century produced an epidemic form of sleeping sickness in Uganda, have assumed their present benign form after sojourn in game animals.

Dr. F. Hawking noted that since bovine and human trypanosomiasis in Africa originated from wild game, control of the disease depended upon control of the reservoir hosts, which need not involve destruction of game. However, Dr. P. L. Le Roux cited examples in favour of destruction of game for the eradication of tsetse. He also drew attention to the possible influence on the epidemiology of trypanosomiasis of temperature, which has a direct effect on the infection rate of tsetse flies. Actually, in the Rhodesias and in Bechuanaland sleeping sickness is restricted to the hottest areas.

Dr. C. A. Hoare, in reply, mentioned the example of *T. vivax*, as a tsetse-borne infection which has spread far outside Africa into countries where it is transmitted by Tabanid flies. He said that evidence of common antigens in trypanosomes of the *brucei* group has also been provided by van Hoof, and referred to recent physiological researches suggesting that the metabolic

processes in various groups of trypanosomes may be correlated with differences in their response to chemotherapy. He also stated that the clinical manifestations due to *T. gambiense* and *T. rhodesiense* were not clearly demarcated.

C. A. Hoare

HEISCH, R. B. **Rhodesian Sleeping Sickness in Kenya Colony.** *J. Trop. Med. & Hyg.* 1948, Nov., v. 51, No. 11, 225–7.

Two cases of sleeping sickness, one African, one European, were observed in 1947 in the south-west corner of Kenya, near the Tanganyika border. The diagnosis was made on (*a*) the acute course of the disease and (*b*) the virulent nature of the infection in subinoculated white rats in whose blood posterior nuclear trypanosomes occurred to the extent of 2–10 per cent. of the total organisms. Monkeys (*Cercopithecus aethiops*) were easily infected; also guinea-pigs which proved the most convenient animals for maintaining the strain. Baboons were completely refractory, and the serum of these animals was found to exert a protective action on rats suffering from the disease though failing to cure them completely.

The blood of 82 local Africans and of 4 antelopes was examined but no trypanosomes were found. One cow showed *T. vivax* in its blood. Approximately 500 locally caught *Glossina swynnertoni* were allowed to bite 8 rats. One of these rats subsequently developed a *T. congolense* infection while three showed polymorphic trypanosomes. The latter were inoculated into a human volunteer with negative results and the trypanosome was therefore presumed to be *T. brucei*.

Laboratory-bred *G. swynnertoni* and *G. palpalis* were fed on animals infected from the European case: 11·4 per cent. of the former and 2·3 per cent. of the latter species of fly became infected. The prevalent tsetse flies of the district were *G. swynnertoni*, *G. pallidipes*, *G. fuscipleuris* and *G. brevipalpis*. [The author observes that the only definite record of Rhodesian sleeping sickness in Kenya Colony was in 1942, when a few Africans were affected by an extension of an epidemic from Uganda.]

P. C. C. Garnham

STRUGGER, S. **Fluorescence Microscope Examination of Trypanosomes in Blood.** *Canadian J. Res.* Sect. E. Med. Sci. 1948, Aug., v. 26, No. 4, 229–31, 1 pl.

The author describes two fluorescence microscope methods for the detection of trypanosomes in scanty infections.

The author had previously demonstrated that acridinorange (3, 6-tetramethyldiaminoacridin) was a vital stain for protoplasm, and has now applied it for selective staining of living trypanosomes in the blood. A drop of blood is mixed with a drop of acridinorange solution (1 in 10,000 of 0·85 per cent. NaCl) on a slide and examined under a coverslip with a blue light fluorescence microscope. The apparatus can be constructed as follows: the source of light is provided by a carbon-arc lamp with attached convex lens, producing a bundle of parallel rays, which are filtered by a cuvette (2·5 cm. thick) filled with a solution of saturated copper oxide ammonia to allow only blue light to reach the plane mirror of the microscope. The latter is of the ordinary type but has an orange-coloured filter inserted over the ocular, in order to absorb blue light.

When a fresh blood preparation is examined under low power of the microscope, the red cells are almost invisible, but the leucocytes are vitally stained, their nuclei and cytoplasm having a strong green fluorescence enabling an accurate count of the leucocytes to be made. The trypanosomes exhibit a

bright light green fluorescence and remain motile. Under oil immersion the cytoplasm fluoresces a diffuse green, the flagella [which the author erroneously calls "cilia"] are stained, and the nucleus and kinetoplast [the author's "blepharoplast"] are clearly seen. Since the living and dead trypanosomes are differently coloured, this method can also be used for assessing the action of chemotherapeutic agents.

For the examination of dried blood films, these are fixed 2–3 minutes in methyl alcohol, washed and stained for 4 minutes in a solution of auramine (1 in 1,000 parts of distilled water, to which 5 per cent. liquid phenol is added), washed again for 1–2 minutes in distilled water and dried in the air. In the stained slide examined with the blue light fluorescence microscope the background is black, the red cells appear as dark green circles, the leucocytes are inconspicuous, and only the trypanosomes show bright golden fluorescence and exhibit their shape and inner structure. The appearance of the trypanosomes in this preparation is illustrated by a plate. *C. A. Hoare*

GASQ. La chimie des trypanocides—Aperçu sur son évolution. [**The Chemistry of Trypanocides ; Development of the Subject.**] *Bull. Méd. de l'Afrique Occidentale Française.* 1947, v. 4, No. 3, 293–7.

The title of this paper will mislead those who may hope to read an account of the historical development of trypanocidal agents from the chemical point of view. It consists of a sketchy chronological review of the introduction and establishment of these substances, in very general terms, which cannot be of any value to serious students of the chemistry of the subject. *E. M. Lourie*

BRUN-BUISSON, P. La trypanosomiase de Sierra-Leone. [**Trypanosomiasis in Sierra Leone.**] *Bull. Méd. de l'Afrique Occidentale Française.* 1947, v. 4, No. 3, 275–82.

A description is given of methods and results of treatment employed a few years ago for sleeping sickness in Sierra Leone. The account is based entirely on information supplied by HARDING. It retails many of the facts, figures and conclusions which Harding has already published [see this *Bulletin*, 1946, v. 43, 105], and contains nothing new since then. *E. M. Lourie*

NODENOT, L. Les derniers médicaments en expérimentation contre la maladie du sommeil. [**The most Recent Compounds under Investigation for Sleeping Sickness.**] *Bull. Méd. de l'Afrique Occidentale Française.* 1947, v. 4, No. 3, 299–302.

Melarsen was first tested, under the designation of No. 4289, by FRIEDHEIM in French West Africa in 1939 [see this *Bulletin*, 1941, v. 38, 634]. In 1946 it was found that of 11 of Friedheim's second stage patients who had been treated intravenously, 3 were cured, 5 were failures (of whom 4 died during treatment) and 3 had disappeared (2 of whom seemed originally to have been improved by treatment). Of 3 who were treated orally 1 was cured, 1 was a failure, and 1 had died of an unknown cause after having apparently been improved by treatment.

In 1941, LE ROUZIC treated 14 second-stage cases, with indifferent results, but the melarsen which he used was 2 to 2½ years old.

In 1946 fresh melarsen was obtained, and, according to Friedheim's recommendations, the dosage-schedule was fixed at 5, 10 and 15 mgm. per kgm (with ceilings of 250, 500 and 750 mgm. respectively) for the first 3 injections, administered at intervals of 5 days, followed by weekly injections (presumably

of 15 mgm. per kilo), to a total of 20 injections per course. Two such courses were prescribed, with an interval of 1 month between them. In one sector, 6 second-stage patients were so treated, of whom 1 died, 1 developed epileptiform convulsions, and 1 became acutely maniacal. The two last-named then responded favourably to tryparsamide. The remaining 3 patients were completing their first course without incident, as were, also, 23 late cases in another sector, at the time of writing.

Melarsen oxide [see this *Bulletin*, 1946, v. 43, 207] has also been tested, again according to dosage-schedules recommended by Friedheim, as follows :— For intravenous treatment : 2 courses of 7 daily injections of 1·5 mgm. per kgm. with an interval of 1 month between the courses. For oral treatment : 2 courses of 8 daily doses of 3 mgm. per kgm., also with an interval of 1 month between the courses. Of 16 late-stage patients treated intravenously 4 were improved, with the cerebrospinal fluid restored to normality, 2 died, and 10 were still under treatment at the time of writing. Of 6 second-stage patients treated orally, 2 were failures and 4 were still under treatment at the time of writing.

The author concludes that melarsen appears to be a mediocre remedy in the second stage ; melarsen oxide, given intravenously, seems to be better, though it is ineffective when given orally. *E. M. Lourie*

FAIN, A. & DE MULDER, P. Essai de chimioprophylaxie collective par la propamidine dans deux foyers de maladie du sommeil humaine à *Trypanosoma gambiense*. [**Mass Prophylaxis by Propamidine in Two Areas of** *T. gambiense* **Infection.**] *Ann. Soc. Belge de Méd. Trop.* 1948, June 30, v. 28, No. 2, 161–77.

Two areas were chosen, in July 1945, in the Banningville territory (province of Léopoldville) for an extensive investigation of mass prophylaxis against trypanosomiasis by means of propamidine. In both these areas, Bougono and Kintswomo respectively, the endemic had proved refractory to control measures persistently applied for a number of years previously. Thus, the numbers of new cases detected in 1943, 1944, 1945 in Bougono were 19, 74 and 95, respectively, in a population of 2,670 ; in Kintswomo they were 71, 27 and 148, respectively, in a population of 3,600. The plan of the investigation differed somewhat in the two areas, and the procedure and results are therefore best considered separately.

(*a*) The Bougono area (population, 2,670) consisted of 12 villages. In July 1945, the 95 new and 24 old uncured cases were given curative courses of treatment. Of the remaining 2,551 people, 2,133 were treated prophylactically and 418 served as controls. The prophylactic treatment consisted of two intramuscular injections, with an interval of six months. The dose was 300 mgm. for men, 230–250 mgm. for women (100 mgm. during pregnancy) ; doses proportionate to weight for children ; and 200–230 mgm. for the aged. The injections were painful, but no abscesses developed, and there were no abortions or other toxic manifestations. The progress of the investigation was as follows ("*Treated group*" refers only to those treated prophylactically) :—

July, 1945.	First treatment.
September, 1945.	*Treated group* ; no cases. *Control group* ; 6 new cases (trypanosomes seen).
January, 1946.	Second treatment.
February, 1946.	*Treated group* ; 358 persons lumbar-punctured, and 7 per cent. found to have increased cell-counts.
May, 1946.	*Treated group* ; 8 cases diagnosed clinically and on cerebrospinal fluid changes (no trypanosomes seen in blood or glands). *Control group* ; 3 new cases (trypanosomes seen).

November, 1946. *Treated group*; 3 cases diagnosed clinically and on cerebrospinal fluid changes (no trypanosomes seen in blood or glands). *Control group*; 7 new cases (trypanosomes seen).

June, 1947. *Treated group*; 3 cases diagnosed clinically and on cerebrospinal fluid changes, with no trypanosomes seen in blood or glands, and 1 in which trypanosomes were seen. *Control group*; 3 new cases (trypanosomes seen).

In summary, among 2,133 treated persons only 1 new case was found with trypanosomes by the end of the two-year period, though there was strong evidence of a high incidence of cryptic infections. Among 418 controls there were 23 new cases, all with trypanosomes. A six-month interval between injections is judged to be too long.

(*b*) The Kintswomo area (population 3,600) consisted of 23 villages. One of these was selected as the "geographical and endemic centre of the area", and after full curative treatment of those recognized to be infected, the remaining inhabitants (205) were treated prophylactically. The other 22 villages served as controls. Prophylactic treatment consisted of only a single injection of propamidine. Progress of the investigation was as follows ("*Treated group*" again refers only to those treated prophylactically) :—

August, 1945. Treatment.

January, 1946. *Treated group*; no new cases. *Control group*; 56 new cases (trypanosomes seen).

May, 1946. *Treated group*; 185 persons lumbar-punctured and 11 per cent. found to have increased cell-counts.

August, 1946. *Treated group*; no new cases. *Control group*; 38 new cases (trypanosomes seen).

January, 1947. *Treated group*; no new cases. *Control group*; 29 new cases (trypanosomes seen).

Here also there was striking evidence of the "sterilizing" effect on the blood and lymphatic system, combined with strong indications of cryptic infections, when lumbar puncture was performed. In the authors' opinion any alteration in the cerebrospinal fluid, in these two areas, is attributable to sleeping sickness, since relapsing fever does not occur and syphilis is very rare.

[This is a valuable contribution, representing field trials of the prophylactic properties of diamidines on a really impressive scale, conducted under the auspices of the FORÉAMI (see this *Bulletin*, 1948, v. 45, 816). It is also the first time that the complication of cryptic infections has been clearly illustrated in field prophylactic work with diamidines.

In discussion, VAN HOOF suggested that many of the people with cryptic infection might have become infected before, rather than after, the prophylactic treatment. FAIN did not think that this could apply to a high proportion of these cases, especially those in whom the cerebrospinal fluid was only slightly altered, toward the end of the two-year period. VAN HOOF also thought that cell-counts without protein-estimations of the cerebrospinal fluids are inadequate since certain (unnamed) observers in the Belgian Congo believe that a moderate increase in cells (up to 100 per cmm.) without increased protein may occur in Africans who appear quite healthy, or who may be suffering from trivial conditions, such as a pruriginous dermatosis.] *E. M. Lourie*

SCHOENAERS, F. Contribution à l'étude de l'action des ultrasons sur les hématies. **Effect of Ultrasonic Waves on Red Blood Corpuscles.** *C. R. Soc. Biol.* 1948, Aug., v. 142, Nos. 15/16, 1080–82, 1 fig.

The author describes observations on the effect of ultrasonic waves on the red blood corpuscles, using an ultrasonic generator with a frequency of 960,000 cycles per second and a power of 14–20 Watts per second. The tests were made

with saline suspensions containing from 20,000 to 900,000 erythrocytes per cmm. The results were assessed by removing samples at regular intervals and counting the red cells in a haemocytometer, the number destroyed being expressed in percentage of the total number of erythrocytes present at the beginning of the experiment.

It was found that the speed with which the red cells were destroyed was inversely proportional to the concentration of the suspension and also depended on the power generated. Macroscopic haemolysis is produced when the concentration of red cells in the suspension is about 2,000–5,000 per cmm. It was impossible to follow the morphological changes in the erythrocytes, for they broke up suddenly, without any preliminary alterations. *C. A. Hoare*

SCHOENAERS, F. Contribution à l'étude de l'action des ultrasons sur les trypanosomes. [**Effect of Ultrasonic Waves on Trypanosomes.**] *C. R. Soc. Biol.* 1948, Aug., v. 142, Nos. 15/16, 1082–4, 1 fig.

The author records observations on the effect of ultrasonic waves on trypanosomes (*T. equiperdum*, *T. evansi*, *T. brucei*, *T. gambiense*, and *T. rhodesiense*) suspended in saline, using a generator described in a previous paper [see above]. The response of the different species of trypanosomes was similar. The rate and degree of destruction of the flagellates depended upon the amount of energy emitted and upon the concentration of the trypanosomes in the suspension. For the same amount of energy the speed of destruction is inversely proportional to the concentration: thus a suspension of 14,000 trypanosomes per cmm. is lysed in 20 seconds, while 75 seconds are required to produce the same effect in a suspension of 48,000 trypanosomes. The different phases of disintegration of the flagellates can be followed under the microscope in Giemsa-stained films. However, the ultrasonic waves do not act upon all the trypanosomes to the same extent, for some individuals may remain morphologically intact, retaining their motility and virulence, longer than others. By inoculating mice with samples of the treated suspension taken at different intervals, infections were produced with a progressively prolonged duration until—after sufficient exposure to the ultrasonic waves—the mice survived. This phase indicates the destruction of all the trypanosomes in the suspension.

C. A. Hoare

NYDEN, Shirley J. **Changes in Ascorbic Acid Metabolism of the Rat during Infection with** *Trypanosoma hippicum*. *Proc. Soc. Exper. Biol. & Med.* 1948, Nov., v. 69, No. 2, 206–10. [11 refs.]

" Dehydroascorbic and total ascorbic acid were measured in the liver, spleen, adrenals, muscle, and plasma of rats infected with *T. hippicum* and the reduced ascorbic acid content of these tissues was calculated. The liver, spleen and adrenals showed significant decreases in reduced ascorbic acid content. The dehydroascorbic acid content of the muscle was increased slightly and both dehydroascorbic and reduced ascorbic acid of the plasma were increased two-fold."

TALICE, R. V. Indices de infección tripanosómica humana en el Uruguay. [**Index of Infection by** *Trypanosoma cruzi* **in Uruguay.**] *An. Facul. de Med. Montevideo.* 1948, v. 33, Nos. 5, 6 & 7, 466–78, 4 figs. on 2 pls. [Bibliography.]

In the author's opinion the surest way of diagnosing *T. cruzi* infection is that of xenodiagnosis, or, as he prefers to call it, xenohaemoculture, for it is " cultivation of the blood of the subject in the intestine of an uninfected

Triatoma". He describes his method of rearing *Triatoma rubrovaria*, *T. infestans*, *T. megista* and *Rhodnius prolixus*, the first two obtained in Uruguay, the last two from the Oswaldo Cruz Institute, Rio de Janeiro. In the town of Rivera in 1946, among 284 tested by this method 20 (7·0 per cent.) were positive, and in Tambores and Valle-Edén in the Department of Tacuarembó there were respectively 139 and 60 tested and 12 (8·6 per cent.) and 3 (5 per cent.) positive. All those tested were under 14 years of age and chosen haphazard among those living in infested ranches. In a future paper the author proposes to give an account of the clinical condition and the electrocardiographic state of some of these subjects. *H. Harold Scott*

SPAIN, D. M., MOLOMUT, N. & WARSHAW, L. J. **Preparations of Lysates from Cultures of *T. cruzi* and their Effects on Normal and Tumor-bearing Mice.** *Proc. Soc. Exper. Biol. & Med.* 1948, Oct., v. 69, No. 1, 134–6.

LEISHMANIASIS

XHAARD. Cas de leishmaniose avec une érythrémie réactionnelle secondaire. [**A Case of Leishmaniasis with Secondary Erythema.**] *Ann. Soc. Belge de Méd. Trop.* 1947, Dec. 31, v. 27, No. 4, 419–27.

An Algerian male, aged 59 years, who had maintained good health all his life, but had two small accidents, the last one during the previous year, involving severe bruising in the left flank at the level of the 12th rib, presented himself complaining of a dull pain in the left flank, asthenia and emaciation.

On examination he was noted to have a cyanotic tinge of the skin of his face and limbs with varicosities on the latter and his tongue was scarlet ; he had gross splenomegaly, reaching down to the level of his umbilicus, moderate liver enlargement, a little fluid in the left pleural cavity, and a temperature of 38°C. The blood count showed a polycythaemia of 7 million red cells per cmm., 18,000 leucocytes with neutrophils—84 per cent., monocytes—3 per cent., and myelocytes—2 per cent. There were albumin and bile salts and pigment in the urine. A little fluid was withdrawn from the chest. Sternal puncture showed 31 per cent. of erythroblasts of which 10 per cent. were megaloblasts. Leuco-gelification of the serum occurred on the addition of formalin, and free leishmaniae were found in the peripheral blood, but not in the sternal or spleen puncture material. A blood culture for N.N.N. medium showed ovoid bodies but no flagellates. A diagnosis of kala azar was made and a course of antimony was begun on August 12th. On August 14th the pain in the left flank had disappeared. A total of 3·5 grammes of sodium antimony tartrate was given. On September 19th the blood count still showed a polycythaemia of 7 millions, but the leucocytes had fallen to 9,000. On October 1st, the count was 6 million red cells and 7,800 leucocytes and next day it was noted that his condition had improved considerably, the spleen was reduced to a hand's breadth below the costal margin and the weight was 63 kilogrammes. By November 15th, the condition had relapsed ; the spleen had enlarged and the weight was down to 60 kilogrammes. From November 18th, the patient was given daily intramuscular injections of "*glucantine de 5 cc. à 30 % d'antimone*". On November 20th, a few leishmaniae were found in epithelial cells in a nasal smear. The patient improved rapidly and by December 13th the blood count was normal. After 18 injections his weight had recovered to 63·9 kilogrammes and the spleen was reduced to half its volume. A nasal smear was negative and on January 25th, 1948 the man returned to his homeland.

The author considered that this was primarily a case of kala azar in which there was a stimulation instead of a depression of the marrow, causing a secondary polycythaemia.

[Surprising features of this case were the failure to find leishmaniae in the spleen and bone marrow when free forms were found in the blood and nasal smears, and the absence of flagellates in the N.N.N. culture.] *L. E. Napier*

MORTON, T. C. & COOKE, J. N. C. **Splenectomy in Kala-Azar.** *Lancet.* 1948, Dec. 11, 920–23, 2 figs. [12 refs.]

" Splenectomy has come to be regarded as entirely contra-indicated in the treatment of kala-azar ", but the authors report three cases which suggest that it may be the only method of cure in drug-resistant cases.

They review the literature on splenectomy from MAKKAS [*Kala Azar Bulletin*, 1912, March, 94] to SWEENEY *et al.* [this *Bulletin*, 1946, v. 43, 114] ; in this last case, splenectomy was performed successfully, but as the result of an error of diagnosis. The present authors report a similar case :—An airman recently returned from India had a large palpable mass in the left hypochondrium, anaemia and leucopenia, and albumin and pus in his urine. A sternal puncture showed no leishmaniae. His spleen, weighing 3,111 grammes, was removed. Leishmaniae were demonstrated in the smears and sections. Pentostam up to a total of 14·2 grammes was given and a complete cure was effected.

In several further quotations from the literature, the authors refer to 4 instances of splenectomy in drug-resistant cases [TIMPANO, this *Bulletin*, 1931, v. 28, 157 : ABRAMI *et al. ibid.*, 1932, v. 29, 499 : MARTIN *et al. ibid.*, 1936, v. 33, 30 : BURCHENAL *et al. ibid.*, 1948, v. 45, 319], and then report two fresh cases. The first of these was a patient of Professor Witts. He had had service in the Sudan and the Mediterranean littoral. He became ill four months after his return to Britain. He had pyrexia of 11 weeks' duration, moderate anaemia and leucopenia (2,600 per cmm.), and a gradually enlarging spleen. All tests, including sternal puncture, were negative and he responded poorly to a course of neostibosan. After a second course of neostibosan a splenectomy was performed and a course of neostam was given. *Leishmania donovani* was found in the spleen. He became afebrile, gained in weight and his blood picture improved. He was eventually discharged cured. This patient showed a persistent lymphocytosis after splenectomy.

The other case was the authors' own, a 24-year-old corporal who developed kala azar in Calcutta and was given a course of treatment (urea-stibamine, 2·9 grammes) to which he responded well clinically. When he returned to England his spleen was still large. He was then given a course of pentostam forte (3·6 grammes). Sternal marrow still showed leishmaniae. After a further course of pentostam (3·6 grammes) sternal marrow was negative in smears and culture, but after a course of pentamidine isethionate (4·32 gm.) the sternal puncture culture again became positive. Further courses of pentostam (3·6 gm. and 3·6 gm.) and pentamidine (2·6 gm. and 2·0 gm.) each caused a temporary clinical improvement, but the man went steadily downhill. His sternal puncture showed no parasites but spleen puncture showed innumerable leishmaniae. His leucocyte count tended to fall after the commencement of each antimony course ; this fall was confined mainly to the granulocytes. The spleen (2,736 grammes) was removed ; after this the leucocyte count, which was below 2,000, rose to nearly 20,000 per cmm. and there was a general all-round improvement which has been maintained for over 6 months. At the time of the splenectomy he was receiving a course of carbostibamide and he was subsequently given another course of pentamidine. The leucocyte count later dropped to the region of 10,000 with a lymphocyte percentage of 55 to 65.

The strain of *Leishmania donovani* isolated from this patient showed no antimony resistance ; the authors therefore conclude that this resistance is a character of the patient. They discuss the possibility that early inadequate treatment may lead to antimony resistance. They consider that the leishmaniac were largely confined to the spleen where the blood stasis in the large sinuses prevented the specific drugs reaching the parasites in adequate strength, and that the spleen acted as a reservoir from whence parasites periodically reached other tissues.

They suggest that splenectomy should be considered in selected drug-resistant cases of kala azar. [Another relapse has since occurred in the last case : a report on this will be published later.] *L. E. Napier*

OSNES, M. **Cutaneous Leishmaniasis. A Case Report.** *Chinese Med. J.* Shanghai. 1948, June, v. 66, No. 6, 327.

A man of 48 who had lived in Mukden since 1941 complained of an increasing but painless mass in the left hypochondrium and also of fever and weakness. He was very emaciated and anaemic and had an extensive splenomegaly. Leishman-Donovan bodies were found on sternal puncture.

Neostam treatment was begun and the next day itching papules were seen on the arms, especially on the extensor surface : each papule was surrounded by a pink halo. The papules increased in a few days to small nodules with central necrosis. Many Leishman-Donovan bodies were found in a smear from serous fluid from one of the nodules. The ulcers healed up in a few days without local treatment, as neostam therapy continued. It is added that the patient also had pustular scabies but there was no similarity between the two eruptions and they were treated separately.

The author comments that the patient had the ordinary type of kala azar frequently seen in Mukden, which was confirmed by the finding of Leishman-Donovan bodies.

The cutaneous eruption, on the other hand, was unusual in that it appeared when the patient began his first specific treatment and it disappeared during the course of it, thus differing from dermal leishmanoid which usually appears a year or more after visceral manifestations have disappeared. The author states in fact that the skin condition more closely resembled a true cutaneous leishmaniasis. *H. J. O'D. Burke-Gaffney*

FEVERS OF THE TYPHUS GROUP

ANIGSTEIN, L. & WHITNEY, Dorothy M., with technical assistance of Norma W. HANSEN. **The Inhibitory Effect of Antiorgan Sera on Experimental Rickettsial Infections in the presence of Testicular Extract.** *Texas Reports on Biol. & Med.* 1948, v. 6, No. 3, 379–84.

This study is in continuation of previous work by ANIGSTEIN *et al.* on the protective influence exercised by anti-organ sera on experimental rickettsial infection [this *Bulletin*, 1948, v. 45, 699].

Those interested in this special line of immunological research will desire to read the original paper.

There is, as yet, no suggestion that the findings have a practical application to the prevention or treatment of typhus fevers. *John W. D. Megaw*

LIU, Wei-T'ung. **Weil-Felix Reaction in Typhus and Non-Typhus Fevers.** *Chinese Med. J.* Shanghai. 1948, June, v. 66, No. 6, 291–306. [45 refs.]

The author, working at the Peiping Union Medical College Hospital, has made a careful study of the Weil-Felix reaction in 286 typhus patients and in 75 persons not suffering from typhus. Tests were carried out at intervals in these cases and single tests were made in more than 2,300 other cases of febrile diseases. The paper contains a documented summary of the findings of other observers of the reaction and a bibliography with 45 references to the literature.

The findings and conclusions of the author conform generally with those of most other workers on the subject.

In the series of 286 cases of typhus fever the reaction was persistently negative in 6·6 per cent.; the maximum titre was 1–40 in 3·5 per cent.; it was 1–80 in 8·1 per cent., and 1–160 in 10·1 per cent. Very high titres of 1–2,560 or over occurred in 25·2 per cent.

Among 141 patients tested during the first week positive reactions occurred in 37·6 per cent.; during the second week a further 55·3 per cent. became positive, and only 6·4 per cent. were delayed to the third week.

Among 2,398 cases of fevers other than typhus 7·4 per cent. reacted at titres ranging from 1–40 to 1–1,280. Dual infection was suspected in two cases. Among 75 cases of fevers other than typhus in which tests were carried out on several occasions there were 7 in which a falling-titre agglutination occurred, and 12 in which the titres reached 1–80 or 1–160, including two in which dual infection was suspected. *John W. D. Megaw*

SMART, J. **Lice.** *British Museum (Natural History) Economic Ser. No. 2A.* 2nd Edition. 1948. 31 pp., 3 figs. [10 refs.] Printed by Order of the Trustees of the British Museum. [9*d.*] [Summary appears also in *Bulletin of Hygiene.*]

Since the first edition of this booklet [see *Bulletin of Hygiene*, 1943, v. 18, 316] a very great advance in louse control has been achieved by the use of DDT. The author has introduced several new paragraphs and sections, in the appropriate places, to describe these new methods. But, at the same time, the more efficient of the older methods of louse control are retained, in case of the possibility of louse infestation in circumstances where DDT was not available. *J. R. Busvine*

HARRISON, J. L. **A Key to the Rats of Malaya.** Reprinted from *Malayan Nature J.* 1948, v. 3, No. 3, 130–41.

Twenty species of rats belonging to the family Muridae, and two species of Rhizomyidae, are briefly described; a key is supplied for their recognition by external characters.

It is stated that Malaysia seems to have been the centre in which rats have originally been evolved, and from which they have spread to the rest of the world.

The paper has been written for the purpose of enlisting the help of amateur naturalists in collecting further information with regard to the rats of Malaya. [See AUDY, below.] *John W. D. Megaw*

POMALES LEBRÓN, A. **Studies on Murine Typhus in Puerto Rico.** *Puerto Rico J. Pub. Health & Trop. Med.* 1948, Mar., v. 23, No. 3, 393–407, 1 fig. [Spanish version 408–21.]

This is a summary of work done on murine typhus in Porto Rico, where the existence of the disease was first recognized in 1940, and where, since that time, about 700 cases have been reported from San Juan alone.

[The English version of the paper by an obvious mistranslation states that 700 cases were reported up to 1940.]

Many sera of patients have been examined by the late Col. Harry Plotz, who found a striking lack of correlation between the titres of the Weil-Felix and complement-fixation reactions. For example, one case with a Weil-Felix titre of 1–102,400 gave a fixation titre of 1–20 for murine typhus, and 1–10 for epidemic typhus. In one case the epidemic titre was 1–640 and the murine 1–320 though the strain was definitely orchitic.

The titres of a number of complement-fixation tests carried out by Dr. Ida Bengtson are reported ; in these the responses to murine antigen were mostly at twice to four-times higher titres than those to epidemic typhus, but in two cases the titres were the same with both antigens—1–2,048 and 1–1,024 respectively.

Among 443 rats trapped at San Juan between December, 1944, and June, 1945, 54 per cent. gave positive fixation reactions.

The urine and faeces of 12 experimentally infected white rats remained non-infective ; the blood became infective in four to seven days, and remained so for about three weeks. Infection persisted in the brains of the rats tested at periods ranging from 26 to 191 days after inoculation, and in the kidneys, lungs, heart, and spleen of two of the rats up to the 26th and 32nd days respectively.

Ten rats were infected by the intraperitoneal route with very large doses of murine rickettsiae ; the animals died in three to six days ; the urine was infective in four out of seven that were tested, and the faeces in three out of seven.

Great difficulty was experienced in infecting rats by feeding them with heavily infected material ; this experience together with the shortness of the period for which infection persisted in the blood and organs of experimentally infected rats " does not agree with the theory that feeding on the carcasses of dead rats is an important and natural method of transmission among these animals " nor with the view that infection with urine or faeces is one of the usual ways of transmission from rat to man. *John W. D. Megaw*

GREIFF, D. & PINKERTON, H. **The Rickettsiostatic Action of Crystalline Penicillin Fractions in Embryonate Eggs.** *Proc. Soc. Exper. Biol. & Med.* 1948, June, v. 68, No. 2, 228–32. [16 refs.]

Penicillin X was found to be two to four times more effective than penicillin G in producing rickettsiostasis in typhus-infected embryonated eggs [murine strain]. Penicillin F, di-hydro F, and K, were much less effective.

These results are regarded as throwing doubts on the validity of the trials of penicillin in human rickettsial infection.

[This point is perhaps of academic interest with regard to the treatment of human typhus now that chloromycetin has been found so effective.]

John W. D. Megaw

SADUSK, J. F., Jr., HJERPE, Constance & FREEDMAN, Mildred. **Effect of Para-Aminobenzoic Acid upon the Clinical Course, Rickettsemia, and Development of Complement-fixing Antibodies of Murine Typhus in the Guinea Pig.** *Amer. J. Trop. Med.* 1948, Sept., v. 28, No. 5, 673–82. [17 refs.]

In the more satisfactory of the two sets of experiments described, seven guineapigs were treated with PABA for five days. Just after receiving the first dose they were inoculated with murine-typhus rickettsiae. At the same time seven control guineapigs were inoculated with similar amounts of infecting

material and all of them reacted in a typical manner with fever and scrotal reaction. Only one of the animals treated with PABA became febrile; this and one other had a moderate scrotal reaction.

Positive complement-fixation reactions occurred in both treated and control guineapigs, and rickettsial strains were recovered from all the treated animals that were tested between the 4th and 8th day after inoculation. The treated animals in which no clinical manifestations occurred were later found immune to murine infection. *John W. D. Megaw*

WILEY, J. S. & FRITZ, R. F. **Tentative Report on Expanded Murine Typhus Fever Control Operations in Southern States.** *Amer. J. Trop. Med.* 1948, July, v. 28, No. 4, 589–97, 6 figs.

This paper consists of a succinct and well-illustrated description of the successful control measures organized in the Southern States of the U.S.A. in 1945 against the rat flea. In the 122 counties in which murine typhus was most prevalent the incidence of the disease fell from 5,338 in 1944 to about 2,200 in 1947, and the decline appeared to be due to the systematic dusting with DDT of the holes and other haunts of rats. In the 460 counties in which dusting was not carried out the incidence remained almost constant, the percentage of rats infested by fleas and the *cheopis* index were very much higher than in the "dusted" counties.

The authors recognize that, although dusting gives speedier control than any other measures, lasting results cannot be obtained without systematic action against the rats.

It is stated that, according to present indications, transmission of infection from rat to man does not occur till 15–20 per cent. of the rats show evidence of past or present infection. Among the instructive graphs which illustrate the paper there is one showing a remarkably close correlation between the seasonal incidence of the disease and the variations in the *cheopis* index.

Dusting was found to cause a reduction by 80 per cent. in the average number of *X. cheopis* found on each rat, and a similar reduction in *Nosopsyllus fasciatus*, the rat flea, *Leptopsylla segnis*, the mouse flea, and the two rat mites, *Echinolaelaps echidninus* and *Laelaps bacoti*. Other ectoparasites were less effectively controlled; the flea, *Echidnophaga gallinacea* was reduced by 35 per cent.; the mite *Liponyssus bacoti*, by 47 per cent.; and the rat louse, *Polyplax spinulosa*, by 26 per cent.

As long as 180 days after dusting the reduction of *X. cheopis* was still 70 per cent. *John W. D. Megaw*

AUDY, J. R. **Natural History and Scrub Typhus.** Reprinted from *Malayan Nature J.* 1948, Sept., v. 3, 114–29, 4 figs. on 2 pls.

This paper, like that of HARRISON [above], is addressed specially to amateur naturalists in Malaya, but professional workers also will find it a very readable and helpful introduction to the mites concerned in the transmission of scrub typhus.

The author expresses the hope that the American name "chigger" for larval trombiculids will be introduced into the English literature because of the unsuitability of the name "harvest mite". He adds, however, the warning that there must be no confusion with the chigoe or jigger flea of Africa, although both this flea and its popular name were originally derived from South America. [It is, perhaps, optimistic to hope that such confusion will not arise; the three names chigger, chigoe, and jigger are probably corruptions of the same Spanish word *chico*, meaning tiny, and their pronunciation is so similar that there is sure to be trouble.] *John W. D. Megaw*

PHILIP, C. B. & HUGHES, L. E. **The Tropical Rat Mite, *Liponyssus bacoti*, as an Experimental Vector of Rickettsialpox.** *Amer. J. Trop. Med.* **1948**, Sept., v. **28**, No. **5**, **697–705**, 1 fig.

The authors have found that *Rickettsia akari*, the causal agent of rickettsialpox, can be transmitted in the laboratory from mouse to mouse by the rat mite, *Liponyssus bacoti*, which is much more widely distributed than the mite *Allodermanyssus sanguineus* [the only known natural vector of the disease, see this *Bulletin*, **1947**, v. **44**, **411**, **707**, **897**, and **990**].

L. bacoti is known to feed readily on man in New York and elsewhere ; it is also known to be an experimental vector and a natural host of murine typhus.

In the present investigation colonies of clean *L. bacoti* were allowed to feed on infected white mice and were later tested for infectivity by letting them feed on young and baby white mice. In the course of numerous experiments of this kind, infection was transmitted to one group of four baby mice in conditions which excluded the possibility that transmission had occurred through the swallowing of the mites by the mice. Although this was the only experiment in which transmission by biting was successful, many of the mites which had fed on infected mice actually became infected, as was shown by injecting suspensions of their bodies into mice.

The observations, of which details are given, are not regarded as indicating that *L. bacoti* is an efficient vector.

Infection was demonstrated in the nymphal progeny of the infected mites, and it was found to persist in a colony of mites for at least 34 days.

The author mentions that previous work has indicated a closer immunological relationship to Rocky Mountain spotted fever than to other rickettsioses, though the essentially negative Weil-Felix reaction is noteworthy. In a footnote it is stated that attempts to transmit infection by the tick *Dermacentor andersoni* have so far been unsuccessful. The negative Weil-Felix reaction and the transmission of infection through mites rather than ticks " provides another instance which complicates reliance on individual characteristics in proposed classifications of the rickettsioses, such as those earlier offered by Megaw and Felix ".

[It should be pointed out that these earlier classifications based on the arthropod vectors and the type of the Weil-Felix response referred only to those rickettsial diseases for which the name typhus was regarded as suitable because of their clinical and pathological resemblance to historical typhus fever. Such rickettsial diseases as trench fever, Q fever, and rickettsialpox cannot suitably be called typhus fevers or even typhus-like fevers.

The antigenic and immunological properties of the typhus and other rickettsial fevers require further study, and at present it is simply a question of choosing a provisional classification which will be most helpful to those engaged in the diagnosis, treatment, and control of these diseases.] *John W. D. Megaw*

PLETZITY, D. F. La tique *Dermacentor silvarum*, agent du typhus exanthématique en Sibérie occidentale. [**The Tick *Dermacentor silvarum*, Vector of Epidemic Typhus in Western Siberia.**] *C. R. Acad. Sci. URSS.* 1947, v. 55, No. 9, 877–8, 1 fig. [Summary taken from *Rev. Applied Entom.* Ser. B. 1948, Nov., v. 36, Pt. 11, 177.]

Apart from Marseilles fever, which occurs in the Crimea and is transmitted by *Rhipicephalus sanguineus*, Latr., the forms of tick-borne spotted fever (atypical typhus) recorded in the Soviet Union all have similar symptoms and etiology. The tick vectors are *Dermacentor nuttalli*, Olen., in south-central Siberia (Krasnoyarsk), *Haemaphysalis concinna*, Koch, in the Maritime Province of the Russian Far East, and *D. silvarum*, Olen., and *H. concinna* in the region of

Khabarovsk, also in the Far East. Several similar strains of rickettsiae have also been isolated from *D. marginatus*, Sulz., and *H. cinnabarina punctata*, C. & F. The diversity of the vectors and the local physical and geographical characteristics of the area in which the disease occurs probably account for the slight differences in its epidemiology and clinical development.

Spotted fever also occurs in the region of Kemerovo in western Siberia, and investigations over several years have shown that it is tick-borne. The ticks found were *Ixodes persulcatus*, Schulze, in forest districts, and *D. pictus*, Hermann, and *D. silvarum* in the steppe ; *D. silvarum* was abundant and had not previously been recorded from the region. Ticks were collected from vegetation, and suspensions prepared by crushing examples of each species were injected intraperitoneally into guineapigs. Three strains of rickettsiae were isolated, two from adults of *D. silvarum* and one from larvae that hatched from eggs deposited by the females in the laboratory. The infection was maintained through 25 passages in guineapigs, during which it preserved its biological properties unchanged, producing fever and scrotal reaction, accompanied by the presence of rickettsiae. The blood of infected persons produced symptoms in guineapigs identical with those observed in the passages, and it was concluded that *D. silvarum* is the vector of the disease.

In the region of Kemerovo, *D. silvarum* occurs chiefly in undulating grassy steppe used for pasture. Observations in the central part of the region showed that it has one generation a year. Mass infestation of cattle and probably of other animals begins as soon as the snow melts and the weather becomes warm, usually towards the end of April, and continues throughout May. Oviposition begins at the end of May, and the larvae hatch at the end of June. Nymphs appear in July and the first half of August, and adults in the second half of August. The larvae and nymphs infest rodents.

Mauzé, J., Ruggiero, D. & Pilin, E. Le typhus tropical en Guadeloupe. [**Tropical Typhus in Guadeloupe.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 7/8, 563–4.

These two papers deal with three cases of typhus-like fevers regarded by the authors as being in all probability tick-borne.

The disease is also referred to as tropical typhus ; this name is obviously inappropriate.

The Weil-Felix reactions in the three cases were as follows :—
(1) *Proteus OXK*, 1–1,000 and *Pr. OX19*, 1–50 ; (2) *Pr. HXK* 1–400, and (3) *Pr. OX19*, 1–300 and *Pr. OXK*, 1–80.

The third patient yielded a strain of rickettsia which was slightly orchitic and which caused a mild illness in the two guineapigs used in its isolation and passage. *John W. D. Megaw*

Mauzé, J. & Pilin, E., Mlle. Les fièvres typhoexanthématiques en Guadeloupe. [**The Exanthematic-Typhus Fevers of Guadeloupe.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 7/8, 442–5.

Woodward, T. E. & Raby, W. T. **Further Concepts in the Treatment of Rocky Mountain Spotted Fever with Para-aminobenzoic Acid.** *Southern Med. J.* 1948, Nov., v. 41, No. 11, 997–1003, 5 figs. [20 refs.]

In 1947 the authors treated 17 patients suffering from Rocky Mountain spotted fever, most of whom were children, with *p*-aminobenzoic acid (PABA). The results obtained were even more striking than those reported by previous observers. All the patients made good recoveries. The only controls available

were the patients treated in the same hospital between 1930 and 1945, and a much larger proportion of these belonged to the higher age groups. The nearest approach to comparable conditions is found in the 11 patients of the present series who were less than 10 years old and the 19 control patients belonging to the same age group. Among the PABA-treated cases the average duration of the fever was 5·8 days ; among the controls it was 15·7 days ; there was no death in either of these groups of children. It may be suggested that only the severest cases among children were admitted during the period 1930–35, seeing that the average yearly admission rate was just over one, as compared with 11 in 1947. But even if the fullest allowance is made for disturbing factors the remarkably rapid improvement observed in the clinical condition strongly suggests that the drug was very effective.

Among the five patients in the present series who were over 20 years old the average duration of the fever was less than 8 days, whereas among the 36 controls of the same age group the average duration was about 17 days among the survivors ; of whom there were only 18,

A significant feature of the study was that treatment was started early, less than four days, on the average, after the onset. To adults a large initial dose of 8·0 gm. was given, and this was followed by doses of 3·0 gm. every two hours till the temperature fell to normal, or longer if the clinical condition remained unsatisfactory. For children the dosage " was generally two-thirds of the adult quantity ".

In severe cases 3·0 to 6·0 gm. were given intravenously in the form of a 20 per cent. solution of sodium-PABA at the same time as the first oral dose.

The blood level aimed at was 40 mgm. per 100 cc. but it appears that in one child aged eight years a level of 111 mgm. was reached on the fourth day of treatment, after a total dosage of 117 gm. orally and 6·0 gm. intravenously. No harmful results were observed from high blood levels maintained for short periods of time.

[Comparative tests of PABA and chloromycetin will doubtless be made in fevers of the typhus group ; the latter drug appears to be more active especially for patients admitted after the 6th day. [See this *Bulletin*, 1948, v. 45, 1076, 1077 ; 1949, v. 46, 27, 131.] *John W. D. Megaw*

Pincoffs, M. C., Guy, E. G., Lister, L. M., Woodward, T. E. & Smadel, J. E. **The Treatment of Rocky Mountain Spotted Fever with Chloromycetin.** *Ann. Intern. Med.* 1948, Oct., v. 29, No. 4, 656–63, 2 figs.

Chloromycetin was given, with remarkably good results, to 15 patients suffering from Rocky Mountain spotted fever at the University Hospital, Baltimore, in May, June, and July, 1948.

The average duration of the fever after the first dose was 2·2 days ; the longest period being 76 hours. Striking improvement in the general condition was always observed by the end of the second day and in most cases convalescence was established within three days.

Rickettsiae had been isolated from the blood of seven patients, and in all of these cases samples taken two days after the first dose was given were no longer infective, but the development of agglutinins and complement-fixing antibodies seemed to progress in the usual way.

In a few cases there was vomiting after the first or second does ; this was suspected of being due to psychic factors and the bitter taste of the drug.

No other evidence of toxicity was found, though regular examinations of the blood and urine were made.

[The controls were not strictly comparable ; they were 46 cases treated at the hospital between 1930 and 1946, and it seems possible that fewer mild

cases were being admitted during that period. Comparison with the effects of treatment by *para*-aminobenzoic acid as reported by WOODWARD *et al.* (see above) may be more appropriate ; in that series the average duration of the fever after the first dose was 3·2 days. But the evidence of the efficacy of chloromycetin is very convincing.]

The drug was given by the mouth ; in most cases 0·5 gm. was given every three hours till the rectal temperature had remained below 100°F. for 24 hours. The first dose was given in three parts at intervals of one hour. The dose for children under 16 years of age was half the above.

The authors suggest the possibility of the occurrence of latent infection after an incomplete course of treatment.

[For previous reports of the effect of the drug in the treatment of epidemic typhus and scrub typhus see this *Bulletin*, 1948, v. 45, 779, 1077 ; 1949, v. 46, 27.] *John W. D. Megaw*

COOKE, C. **Rocky Mountain Spotted Fever treated with Aureomycin.** *J. Amer. Med. Ass.* 1948, Nov. 20, v. 138, No. 12, 885, 1 chart.

Rocky Mountain spotted fever is not uncommon in the eastern part of Long Island, N.Y. and there are usually 10 to 15 cases annually in Suffolk county. The mortality varies throughout the country in some places and in some years from 15 per cent. to as high as 37·5 per cent. in the Bitter Root Valley.

The author records the case of a woman of 28 who was admitted to Huntington Hospital in July, 1948 with a three-day history indicating an acute exanthem. In the previous two weeks she had found two or three embedded ticks on her body, the last about six days before the illness began. There was no history of exposure to contaminated food or water or evidence of rat or louse infestation.

The clinical examination which is described suggested a diagnosis of Rocky Mountain spotted fever. Pending results of blood culture to exclude meningococcaemia, 900,000 units of penicillin in 3 doses at intervals of six hours were given and discontinued when the blood culture proved negative.

Some aureomycin was obtained and given orally from the day after admission (the fourth day of illness) in a dosage of 1 gm. every six hours for 48 hours : at the beginning of treatment, the rash was pronounced and violaceous and the temperature was spiking to 104°F. After 48 hours of treatment, it had returned to normal and the symptoms had abated dramatically. The dosage of aureomycin was reduced to 0·5 gm. every 6 hours for the next 24 hours, making a total of 10 gm. There was no evidence of toxicity other than that of transitory (and probably unrelated) nausea and vomiting. Improvement continued, the rash had gone on the ninth day and the patient was discharged on the tenth. Blood, urine and stool examinations and cultures were negative, as were serological tests, except that on the fourth day (when other agglutination and complement-fixation tests were negative), the patient's serum agglutinated *Proteus OX19* at a titre of 1/40. On the tenth day, however, the reaction to the complement-fixation test was positive for Rocky Mountain spotted fever in a titre of 1/88. This was confirmed by Dr. Cox at the Lederle Laboratories who reported a positive result at 1/64. The reaction to rickettsialpox complement-fixation (which has been found to be somewhat more sensitive in detection of "spotted fever" early in the disease) also became positive, in lower titre, by the tenth day.

The author observes that in a disease where a severe febrile course of 2 to 3 weeks might be expected, response to aureomycin was prompt and that this is further evidence of its efficacy against the rickettsiae of Rocky Mountain spotted fever. *H. J. O'D. Burke-Gaffney*

LACKMAN, D. & PARKER, R. R. **Comparison of the Immunogenic and Anaphylactogenic Properties of Rocky Mountain Spotted Fever Vaccines prepared from Infected Yolk Sacs and from Infected Tick Tissue.** *Amer. J. Pub. Health.* 1948, Oct., v. 38, No. 10, 1402–4.

"Rocky Mountain spotted fever vaccines prepared from infected yolk-sacs and from tick-tissue were about equally active in producing immunity in guinea pigs. The protein present in the tick-tissue vaccines failed to produce anaphylaxis in guinea pigs, whereas that present in yolk-sac vaccines produced anaphylaxis in 58 per cent. of the guinea pigs tested."

JELLISON, W. L., BELL, E. J., HUEBNER, R. J., PARKER, R. R. & WELSH, H. H. **Q Fever Studies in Southern California. IV. Occurrence of** *Coxiella burneti* **in the Spinose Ear Tick,** *Otobius megnini*. *Pub. Health Rep.* Wash. 1948, Nov. 12, v. 63, No. 46, 1483–9. [12 refs.]

The authors have isolated 10 strains of Q-fever rickettisae from batches of nymphal ticks belonging to the family of Argasidae. The ticks were *Otobius megnini*, which were collected from the ears of cattle belonging to four dairies in which the organism had been isolated from raw milk; in one of the dairies cases of Q fever had occurred among persons employed in the dairy. [See this *Bulletin*, 1948, v. 45, 509.]

Altogether 246 lots of ticks were examined in the course of the investigation. Evidence of transmission of the disease by ticks in California had hitherto been lacking because ticks had never been found on cattle of the infected herds, but after attention had been called to the occurrence of *O. megnini* on cattle of similar herds a search was made, with the interesting result that infection has been discovered for the first time in the U.S.A. among Argasid ticks.

It is stated that in addition to the two species of *Dermacentor* and one of *Amblyomma* already found naturally infected in the U.S.A., two other species of ticks have been found naturally infected in that country, but the data have not yet been published.

One lot of four infected ticks was found on a cow whose serum gave a positive complement-fixation reaction at 1–128; another lot of five was from a cow reacting at 1–8. The other lots of infected ticks, consisting of 20–25, were from batches of cows, only some of which gave positive reactions.

The guineapigs employed in isolating the strains gave typical febrile reactions; fixation responses at titres of 1–128 to 1–2,048, and typical lesions of experimental Q fever were found, including numerous rickettsiae in smears of the exudate at the site of subcutaneous inoculation.

Although *O. megnini* is the first Argasid tick found naturally infected, DAVIS [this *Bulletin*, 1943, v. 40, 903] has reported experimental infection in two other species, *Ornithodorus moubata* and *O. hermsi*, and in the former of these trans-ovarial infection has been reported; as *O. megnini* feeds only on a single host this type of infection must occur if the tick is a vector of the disease.

[The authors appear to have accepted the view of PHILIP that the organism of Q fever belongs to a genus distinct from the true rickettsiae and have adopted the name *Coxiella burneti* instead of the original name *R. burneti*, and the name *R. diaporica* formerly used in the U.S.A. (See this *Bulletin*, 1948, v. 45, 424.)]

John W. D. Megaw

DE RODANICHE, Enid C. **Cross-Immune Reactions between Panamanian Strains of Q Fever and Endemic Typhus.** *Amer. J. Trop. Med.* 1948, Sept., v. 28, No. 5, 683–6.

Four of six guineapigs which had been immunized against murine typhus were regarded as showing a partial degree of immunity when challenged with

an inoculation of a Panama strain of Q fever; the average duration of the incubation period and of the fever was appreciably shorter than in the four control animals. Two other guineapigs immunized in the same way were challenged with a yolk-sac suspension of the same strain of Q fever; they and the two controls were equally overwhelmed by the challenging strain.

In the reverse experiments, 12 guineapigs convalescent from experimentally produced Q fever were challenged with murine-typhus infection and showed no significant protection against the febrile reaction; but only two of them developed scrotal reactions whereas nine of the twelve control animals had reactions.

With complement-fixation tests no significant cross reactions were observed.

[Some workers may doubt whether such degrees of partial immunity as were observed in these experiments are due to specific rickettsial antibodies. Guineapigs convalescent from attacks of experimental rickettsial diseases are not strictly comparable with previously healthy control animals.]

John W. D. Megaw

OLIPHANT, J. W. & PARKER, R. R. **Q Fever: Three Cases of Laboratory Infection.** *Pub. Health Rep.* Wash. 1948, Oct. 15, v. 63, No. 42, 1364–70, 3 figs.

Three cases of laboratory infection with Q fever are described; they occurred in August 1947, January 1948, and February 1948, respectively, at the Rocky Mountain Laboratory where work on the rickettsiae of the disease has been carried out more or less continuously since 1935.

Mention is made of three previous cases which occurred among employees of the laboratory in January 1941, April 1941, and March 1942. One of these persons had not been known to have been in contact with the block of buildings in which work on Q fever was being done.

One of the present patients was employed in a unit engaged in the production of Q fever yolk-sac vaccine; another was working in a unit in which animal inoculations with Q fever rickettsiae were carried out; the third was a frequent visitor to the office rooms of the Laboratory.

The mode of infection is not discussed. *John W. D. Megaw*

RABIES

KOPROWSKI, H. & COX, H. R. **Occurrence of Rabies Virus in the Blood of Developing Chick Embryo.** *Proc. Soc. Exper. Biol. & Med.* 1948, July–Aug., v. 68, No. 3, 612–15. [12 refs.]

The authors, in the course of previous studies on rabies infection in the developing chick embryo (*J. Bacteriology*, 1947, v. 54, 74, abstract of a paper read at a meeting of the Society of American Bacteriologists), had obtained results, which indicated a distribution of rabies virus throughout the tissues of the embryo with no particular affinity to the central nervous system and which suggested a haematological spread of the virus and, therefore, presence of the virus in the blood of the embryo.

In connexion with the latter possibility, the authors carried out a further series of experiments, the results of which may be summarized as follows:

Rabies virus (FLURY strain) was inoculated by the yolk-sac route into 7-day-old chick embryos. By means of intra-cerebral injections into albino Swiss mice, 21 to 28 days old, the virus was recovered from the chick-embryo

blood from the 3rd to the 15th post-inoculation day. Such finding was practically constant, irrespective of the use, for mouse inoculation, of chick-embryo red blood cells in saline solution or of chick-embryo plasma, undiluted or in serial tenfold dilutions with 10 per cent. rabbit serum-saline.

These results do not, of course, help to solve the still highly controversial question whether rabies virus is present in the blood of infected mammals.

G. Stuart

PAWAN, J. L. **Fruit-Eating Bats and Paralytic Rabies in Trinidad.** *Ann. Trop. Med. & Parasit.* 1948, Sept., v. 42, No. 2, 173–7.

For the past 16 years it has been generally recognized that the paralytic rabies of man and animals in Trinidad is ordinarily spread by the bite of the blood-lapping vampire bat *Desmodus rotundus murinus* Wagner, family Desmodontidae.

Two facts suggested, however, the possibility of vicarious rabies transmission to mammals by the bite of fruit-eating Phyllostomidae bats, normally non-blood feeders, *viz.* (1) in Brazil during 1921 it had proved possible to produce paralytic rabies in rabbits and guineapigs by the intramuscular injection of the brain of a "leaf-nose" bat, *Phyllostoma superciliatum* Burmeister, and (2) in Trinidad a total of five fruit-eating bats, *Artibeus planirostis trinitatis*—the commonest species found there—had been shown to have Negri bodies in their brains.

To determine definitely whether fruit-eating bats do at times bite mammals and so produce rabies was the object of the experiments described by the author in the present article.

Results showed that "as with the blood-sucking vampire bat, fruit-eating *Artibeus* bats may prove refractory to infection with rabies virus; but, though they may not manifest any evidence of disease, their saliva may carry infection. Fruit-eating bats, when infected with rabies, may bite mammals, not necessarily with the object of obtaining blood for food, but on account of a change in habit through being rabid. Mammals so bitten may develop rabies."

G. Stuart

JOHNSON, H. N. **Derriengue : Vampire Bat Rabies in Mexico.** *Amer. J. Hyg.* 1948, Mar., v. 47, No. 2, 189–204. [18 refs.]

Derriengue (*el tronchado* in some localities) is the ordinary Spanish name for a highly fatal paralytic disease of livestock, especially cattle, which for nearly half a century has been prevalent in the Pacific coast states of Mexico and which, in recent years, has spread further and further inland as well as to the southwest.

In 1932 a virus, which was considered to be the specific aetiological agent of derriengue, had been isolated from affected cattle but, although in symptomatology and pathology the experimental disease produced by this virus closely resembled rabies, the antigenic relationship of the viruses of the two diseases had not been determined.

Moreover on epidemiological grounds doubt had been cast on probable relationship from the fact that derriengue was often epizootic in regions where canine rabies was unknown and that, despite the noted similarity of derriengue to paralytic rabies of vampire bat origin, vampire bats had not been identified in areas where derriengue was obtrusive.

In 1943, from a specimen of brain tissue obtained from a cow exhibiting the characteristic paralytic disease was recovered a virus, which later proved to be antigenically related to known strains of rabies virus.

Following on this finding the author was requested in 1944 by the Natural Sciences Division of the Rockefeller Foundation to undertake in epizootic

areas a series of field investigations, with a view to obtaining additional specimens for subsequent laboratory studies and to instituting a search for wild animal vectors of rabies, including vampire bats.

In the exceedingly interesting and informative article under review are detailed the results of these investigations and studies, which conclusively prove the identity of derriengue with rabies and indicate that the principal vector is the vampire bat, *Desmodus rotundus murinus* Wagner. *G. Stuart*

JONES, W. E. **Rabies in a Young Cow.** *J. Amer. Vet. Med. Ass.* 1948, Dec., v. 113, No. 861, 567.

A case diagnosed at post mortem.

PLAGUE

ISAAC RIAZ, R. Aspectos epidemiologicos de la peste en Venezuela. [**Epidemiological Aspects of Plague in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 93–110, 1 map. [12 refs.]

This is a concise description of the epidemiology of plague in Venezuela where the disease first appeared in 1908, at La Guaira, which was the only port of the country that was affected, and in which there were 64 cases with 38 deaths in the six-month period during which the epidemic lasted. In the same year the capital, Caracas, was affected, and by 1910 the disease had extended to the rural areas of the State of Miranda from which it has not yet entirely disappeared. It persisted in Caracas till 1919, and during the first four years there were 172 cases ; during the following years there were 32 cases.

By 1919 the disease had disappeared from the urban areas, and since 1928 it has been restricted to certain rural areas in Miranda and Aragua ; the affected zone being about 1,000 square kilometres in extent, roughly one per thousand of the area of Venezuela. The outbreaks have been occurring once every four or five years and the average yearly number of deaths has been about four.

Details are given of the rodent population and their arthropod parasites. The author discusses the various factors responsible for the persistence of the infection in the affected areas, for the spread of infection from urban to rural areas, and for its extension from one rural area to another.

John W. D. Megaw

FAVAREL, R., CARRIÈRE, M. & CHARTRES, A. Guérison de trois cas de peste pulmonaire primitive par le traitement sulfamidé. [**Cure of Three Cases of Primary Pneumonic Plague by Sulpha Drugs.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 7/8, 506–11.

LEWIN, W., BECKER, B. J. P. & HORWITZ, B. **Two Cases of Pneumonic Plague. Recovery of One Case treated with Streptomycin.** *South African Med. J.* 1948, Nov. 27, v. 22, No. 22, 699–703, 5 figs.

Two cases are described ; the first was of a laboratory worker who had been handling a virulent dried culture of plague bacilli and who had an attack typical of lobar pneumonia but post-mortem investigation showed the presence of plague infection ; the second was a person who had been in close contact with the first patient and developed an attack typical of primary plague pneumonia ; the diagnosis was confirmed by laboratory investigation. Treatment from the third day of the illness was by streptomycin, 1·8 gm. daily for eight days, and

by a total of 24 gm. sulphadiazine or sulphathiazole for eight days. Antiplague serum was also given—100 cc. on the 4th day and 25 cc. on each of the two following days.

By the 9th day the temperature fell to normal after a very severe illness, but on the 11th day it rose again though plague bacilli could no longer be found in the sputum. Penicillin was then given for five days—200,000 units daily—and a further course of sulphonamide drugs, totalling 30 gm., was given. From the 14th day the temperature remained normal and the patient made a good recovery. The first patient had received inoculations of live, avirulent, plague vaccine on several occasions, the last being 10–12 days before his illness, the second patient had not been vaccinated. *John W. D. Megaw*

HARRISON, J. L. & WOODVILLE, H. C. **An Attempt to control House Rats in Rangoon.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 247–58, 1 fig.

The chief impression conveyed by this paper is that rat destruction by poisoning with barium carbonate is unlikely to make more than a partial and temporary impression on the rat population. In a large area in which preliminary baiting in accordance with accepted practice preceded the distribution of the poison it was found that the number of rats trapped nightly was reduced by about 60 per cent. The author concludes that barium carbonate is a low-efficiency poison, though in the summary he describes the results as satisfactory.

Figures quoted in the paper to show the results of previous efforts to control rats in Rangoon by trapping are interesting. In 1934 and the following four years the numbers of rats trapped were, respectively, 734,000 ; 769,000 ; 753,000 ; 716,000 ; and 569,000. [These figures suggest that trapping, as carried out, may almost be regarded as having a favourable influence on the rat population —from the point of view of the rats—by helping to maintain a satisfactory balance between the rat population and their food supply.]

In the present attempt at rat control gassing with "Cymag" gave poor results, and so did trapping, during the period May to November, 1945.

The rodents found in Rangoon were *Bandicota bengalensis* (31 per cent.), *Rattus exulans* (45 per cent.), *R. rattus* (8 per cent.), *R. norvegicus* (6 per cent.), *Mus musculus* (5 per cent.), and the shrew *Suncus caeruleus* (4 per cent.).

Plague infection was found in 2 of 41 *R. rattus* and in 1 of 75 *B. bengalensis*. The fleas found were *Xenopsylla astia* and *X. cheopis*.

On *R. rattus*, which was regarded as the chief reservoir of infection, the average number of *X. cheopis* was 0·30 and of *X. astia* 0·23.

John W. D. Megaw

AYUB, V. & PÉREZ, J. Indice de ecto-parasitos en ratas y su control con DDT. [**Ectoparasite Indices and the Control of Ectoparasites in Rats with DDT.**] *Rev. Chilena de Hig. y Med. Preventiva.* 1948, June, v. 10, No. 2, 63–94, 3 figs. [51 refs.]

POLLITZER, R. **Plague and Plague Control in China.** *Chinese Med. J.* Shanghai. 1948, June, v. 66, No. 6, 328–33.

The author is an Epidemiologist of the World Health Organization, China Mission ; he has presented a clear and succinct description of the plague situation in China during 1946 and 1947. The Province of Fukien was most severely affected, having 6,141 reported cases in 1946 and 1,542 in 1947. The Provinces of Yunnan, Kwantung, Chekiang, and Kiangsi were less affected, the yearly number of cases ranging from 173 to 823.

The recent importation of the disease from Burma is regarded as a repetition of the invasion of more than 100 years ago, of which the final culmination was the historic outbreak at Canton and Hong Kong in 1894. The epidemiology of the disease in China appears to have been very similar to that observed in India. Points of interest are the frequent occurrence of pestis minor and the absence of septicaemic cases in Yunnan, and the occasional occurrence of limited outbreaks of primarily pneumonic plague in areas free from the disease ; these outbreaks were always due to the arrival of a traveller from infected areas. Sulphadiazine is regarded as the best of the sulphonamide drugs. Reports of the cure of 50 per cent. of cases of primary pneumonic plague at Mukden are not regarded as being based on satisfactory evidence.

Inoculation with formol-killed vaccine is regarded as definitely useful though it is not yet popular in China where even the medical men are said to be haunted by the quite unwarrantable fear of the negative phase.

Some observations are mentioned which suggest that persons exposed to risk of infection by pneumonic plague may be protected by prophylactic treatment with 3·0 gm. sulphathiazole daily for three days.

John W. D. Megaw

CHOLERA

ZAKI, A. & RAGAB, M. M. **Circulatory Dynamics in Cholera. Their Mechanism and Prognostic Significance.** *J. Roy. Egyptian Med. Ass.* 1948, Oct., v. 31, No. 10, 770–85.

The circulatory changes in cholera were studied in relation to the degree of dehydration occurring, with consequent haemo-concentration and oligaemia. It was found that venous pressure was lowered in all cases and that the degree of lowering was proportionate to the severity of the case. Additional factors contributing to the fall in venous pressure were the increased viscosity of the blood, compensating vasoconstriction and loss of muscle tone. Arterial pressure is also lowered but is related to clinical severity to a lesser degree ; the higher the diastolic pressure the better the prognosis. The circulation time was found to be only slightly prolonged and of no value in prognosis. Pulse rate is not a dependable sign. The circulatory failure in cholera is considered to be peripheral in origin.

J. Taylor

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

STEWART, G. T. **The Rôle of Bacteria in Intestinal Amoebiasis in Man.** *Ann. Trop. Med. & Parasit.* 1948, Sept., v. 42, No. 2, 198–206. [31 refs.]

The bacterial flora of the intestines of 101 men suffering from amoebiasis was compared with that of 120 patients with no intestinal disorder. In early dysenteric cases there was a marked increase in the frequency of *Bact. aerogenes*, and in late relapsing cases with chronic lesions in various stages of activity a significant increase of non-lactose-fermenting bacteria mainly identified as paracolon bacilli. The prevalence of *Strep. faecalis* in both groups was thought to be a result of intestinal hurry [this *Bulletin*, 1948, v. 45, 788]. None of the recognized pathogens was isolated. Agglutinins to the predominant organisms were not found in the sera of the patients. It is considered that the increased

incidence of *Bact. aerogenes* is associated with the acid reaction of the exudate, and that the paracolon bacilli and *Bact. coli* are potential pathogens introducing an added element of bacterial infection in a bowel which is the site of amoebic lesions. These findings may be related to the occurrence of "post-dysenteric colitis" and to the observation that cases of amoebic dysentery sometimes benefit from treatment with antibacterial agents. *J. C. Cruickshank*

SAMUEL, E. **The Radiological Diagnosis of Chronic Amoebic Colitis.** *Brit. J. Radiol.* 1948, Dec., v. 21, No. 252, 625–31, 10 figs.

This paper discusses the indications for and the place of radiology in the diagnosis of chronic amoebic colitis and also discusses the methods used. Most of the material and radiographs illustrating it are the same as those presented in the paper in which the present author collaborated with BEEMER and SHEDROW [this *Bulletin*, 1949, v. 46, 146]. *H. J. O'D. Burke-Gaffney*

PARNELL, R. W. **Diodoquin compared with E.B.I. and Chiniofon in the Early Treatment of Amoebic Dysentery in Burma.** *J. Trop. Med. & Hyg.* 1948. Oct., v. 51, No. 10, 200–202.

For this report only those cases have been selected in which a follow-up, consisting of clinical examination, sigmoidoscopy and microscopic examination of three specimens of stool, was completed after the courses of treatment described. The diagnosis was based in each case on finding typical motile *E. histolytica*.

Course I consisted of emetine, E.B.I. and chiniofon retention enemata (34 patients): 21 patients tested for cure *one* month after leaving hospital showed 14 apparently cured (=66 per cent.); 13 patients tested at *one* and again at *two* months showed 10 apparently cured (=77 per cent.).

Course II consisted of emetine and diodoquin (34 patients): 23 tested for cure *one* month after leaving hospital showed 18 apparently cured (=79 per cent.); 11 tested at *one* and again at *two* months showed 7 apparently cured (=64 per cent.).

The details of the courses are as follows:—

Course I.

Emetine, 1 grain daily on days 1 to 6 and sulphaguanidine to a total of 100 gm. during days 1 to 5.

E.B.I., 3 grains daily on days 7 to 12 and chiniofon retention enema ($2\frac{1}{2}$ per cent.) on days 7 to 16.

Rest on days 17 to 19.

E.B.I., 3 grains daily on days 20 to 25.

Course II.

Emetine, 1 grain daily on days 1 to 6 and sulphaguanidine to a total of 100 gm. during days 1 to 5.

Diodoquin, 9·6 grains (3 tablets) three times daily on days 7 to 26.

In Group I, nine had recent or associated bacillary exudate, 6 others had received sulphaguanidine for acute diarrhoea and 6 more had a history of bacillary dysentery.

In Group II (diodoquin, 34 cases), 7 had a recent or associated acute bacillary exudate on admission, 11 had received sulphaguanidine for acute diarrhoea, 4 others had a history of bacillary dysentery.

In both groups, only 37 per cent. had no previous history recorded for acute diarrhoea in India or Burma.

It is concluded that in two groups treated early for amoebic dysentery in Burma no difference in effectiveness of treatment was noted between them.

A relapse rate of more than 20 per cent. was found within two months of treatment, by means of the standards of follow-up described.

[It is not stated in what form the E.B.I. was administered : it has been shown that it is not absorbed in tablet form. This appears to be the real gist of the matter.] *P. Manson-Bahr*

[The author, in a personal communication, has confirmed that the dosage schedules as given above are correct : in the form in which they were set out in the original paper, there was some ambiguity.—Ed.]

ARMSTRONG, T. G., POOLER, N. R. & ELSDON-DEW, R. **Chlorobexol : Clinical Trial of a New Treatment for Amoebiasis.** *South African Med. J.* 1948, Nov. 13, v. 22, No. 21, 691–2.

The Amoebiasis Research Committee of the Natal Coastal Branch of the South African Medical Association investigated the claim, advertised to the medical profession, that Chlorobexol was a curative agent in amoebiasis.

The active ingredients of this preparation are stated to be : chlorophenoxyl acid tetrachlor-para-benzoquinone, 2 per cent. ; hydrocarbon derivatives, 5 per cent. ; uranium chloride, 1 in 1,000,000.

The preparation was used in 29 African patients, all of whom showed ulceration of the bowel and in whom vegetative forms of *E. histolytica* were found in stools or scrapings. Results were assessed in 7, 14 and 21 days : in a number of patients treatment with emetine and diodoquin had to be given before the end of the test period, owing to serious deterioration in their general health. The tests with chlorobexol were compared with a series of 50 cases treated with emetine (1 grain daily for 10 days) or diodoquin (10 tablets daily for 20 days).

The criteria in all cases were :

(1) Ulcers covered with epithelium; no amoebae in scrapings and stools: success.

(2) Open ulcers, no demonstrable amoebae : probable failures.

(3) Open ulcers and demonstrable amoebae : absolute failures.

After 14 days, there was only one success out of the 29 patients, and after 21 days, there were only 2 successes in the 19 patients then remaining. In the case of those controls treated with emetine, there were 25 successes out of 50 after 21 days and with diodoquin there were 29 out of 50.

It is noted that among the 17 out of 19 patients who showed visible ulcers in the colon at the 21st day of chlorobexol treatment, none showed amoebae in the stools, but no less than 10 showed active amoebae in scrapings from ulcers, a reminder that negative stools are not a reliable criterion of the absence of amoebic infection. It is added that in this series of investigations, in 57 different tests amoebae were found in the scrapings, but not in stools, on 45 occasions : on 10 occasions they were found in both stools and scrapings and in two in stools, but not in scrapings.

The Committee concludes, as a result of this investigation, that chlorobexol is not an effective amoebicidal agent and that the results of treatment with it are markedly inferior to those obtained with either emetine or diodoquin separately. *H. J. O'D. Burke-Gaffney*

SCHNEIDER, J. & MONTÉZIN, G. Amibiase expérimentale et amibiase spontanée du rat. [**Experimental and Spontaneous Amoebiasis in the Rat.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 7/8, 521–5.

The authors, recognizing the limitations of the *in vitro* methods of testing amoebicidal drugs, have sought a good experimental host. They believe the

kitten, although unresponsive to emetine, to be the most suitable, but difficulties, chiefly of supply, prevented large-scale use of this animal. They therefore followed the experimental procedure of JONES [this *Bulletin* 1947, v. 44, 313] who used young rats weighing 20 to 33 gm. for the evaluation of amoebicidal drugs, after intracaecal inoculation of *E. histolytica* from culture material. Like the original and other authors they found that the resulting infections were very variable as a result of this procedure. The amoebae present at autopsy could not be cultured in the usual media employed (a common experience with *E. muris*), cysts were rare and vegetative forms were seldom present in the rats' faeces. These facts led them to doubt the nature of the infection and to suggest that the amoebae present were *E. muris*, which naturally infect the rat. A systematic survey of rats of different ages for the presence of natural infections with *E. muris* was carried out and the authors found that the distribution corresponded, as regards age, with that of amoebae in rats experimentally infected by the above procedure (older age groups are refractory). They quote, inaccurately, the results of FULTON & JOYNER [this *Bulletin*, 1948, v. 45, 430] who carried out a similar survey in a number of laboratory rodents because of the widespread occurrence of natural amoebic infections in rats used for chemotherapeutic tests, and adduce the evidence of these authors in further support of their own observations. [It is not stated in the paper whether staining methods were used to determine the nature of the amoebae present in the rat gut. The authors' evidence that they were indeed *E. muris* is not convincing. While JONES, in the paper quoted, made no mention of a natural amoebic infection in rats, he did distinguish by staining methods the presence of *E. histolytica* in gut tissues. Vegetative forms, and occasionally cysts, of this organism were sometimes present in rat faeces in the early stages of infection. The infection could not, however, be regularly detected by examination or culture of the rat faeces. In a subsequent paper STEWART and JONES (this *Bulletin*, 1948, v. 45, 1001) stated that one or more species of amoebae were sometimes present in the rat caecum, and that there was no evidence that the experimental infections coincided with a natural infection. They were able to culture the amoebae present.]

J. D. Fulton

LAMY, L. Le problème de la culture pure des amibes parasites. [**Pure Culture of Parasitic Amoebae.**] *C.R. Soc. Biol.* 1948, May, v. 142, Nos. 9/10, 633–4.

Hitherto all attempts to grow the human intestinal amoebae, especially *Entamoeba histolytica*, in pure culture, *i.e.* in the absence of accompanying bacteria, have failed. The author has made an indirect approach to this question, working with *E. invadens*, the pathogenic reptilian parasite, which can be cultivated at 25°C. and is generally more amenable to experimental manipulations. It was hoped that results obtained with this amoeba would help to solve the problem of growing pure cultures of *E. histolytica*.

With the aid of de Fonbrune's micromanipulator a culture was obtained of *E. invadens* associated with a single staphylococcus in media consisting of a slope of inspissated horse serum, covered with a mixture of Ringer's solution and horse serum (6 : 1), with the addition of rice starch, a small piece of viper's liver and a small amount of ground chick embryo. The sterility of the medium was controlled by broth cultures. The staphylococcus was eliminated from the pure mixed culture with *E. invadens* by adding penicillin in doses up to 1,000 units per cc. Up to the present the author has succeeded in obtaining several subcultures of the amoebae, which were bacteriologically sterile.

C. A. Hoare

BARKSDALE, W. L. & ROUTH, C. F. *Isospora hominis* **Infections among American Personnel in the Southwest Pacific.** *Amer. J. Trop. Med.* 1948, Sept., v. 28, No. 5, 639–44. [15 refs.]

In the course of routine stool examinations in the South-West Pacific war area, the authors discovered 50 cases of infection with *Isospora hominis* among Americans, of whom 5 were from New Guinea, 5 from Leyte, 39 from Luzon and one from Japan. The Luzon cases represented 1·65 per cent. of the persons examined (2,000 troops), including 16 found among 270 individuals belonging to one regiment. Coccidia were not detected in 750 Filipinos examined or in over 17,000 Japanese on Honshu.

The course of coccidiosis was followed in 15 patients kept under observation for 24 days. The symptoms ranged from slight intestinal disturbance to seizures with cramping, nausea and diarrhoea. The blood picture was normal, except for an eosinophilia of about 9·5 per cent. The oöcysts of *Isospora* were discharged in the stools cyclically, at irregular periods which lasted several days, When kept at 85-90°F. the oöcysts underwent sporogony and matured in 48 hours.

No attempt was made to treat the disease, which is self-limited, but it was found that drugs used for concomitant disorders (tetrachlorethylene, emetine, carbarsone, chiniofon, diodoquin and atebrin [mepacrine]) had no action upon the coccidia, which continued to produce oöcysts. *C. A. Hoare*

MATSUBAYASHI, H. & NOZAWA, T. **Experimental Infection of** *Isospora hominis* **in Man.** *Amer. J. Trop. Med.* 1948, Sept., v. 28, No. 5, 633–7, 2 figs.

Human infections with *Isospora hominis* have been reported from Japan on six occasions since 1939. In two cases the infection was acquired in China, while the remaining four were of local origin They were characterized by diarrhoea and various abdominal symptoms, without a rise of temperature. In order to observe the course of the disease, experimental infections of two volunteers were carried out, with oöcysts obtained from two different cases. The oöcysts were first washed by centrifugation and kept for more than 72 hours at 28°C., until sporogony was completed.

In the first experiment, a volunteer (one of the authors) ingested about 3,000 oöcysts. Eight days later symptoms of diarrhoea developed and there was a rise of temperature, the febrile condition lasting ten days, with temperatures above 39°C. On the following day the diarrhoea subsided but later the symptoms returned and were especially pronounced on the 17th day of the infection, after which they disappeared completely. Starting from the 9th day of the infection oöcysts of *I. hominis* were discharged regularly for 32 days.

Thirty-three days after the cessation of oöcyst-production in this person, he and another volunteer swallowed about 2,500 oöcysts each. In the first volunteer no infection resulted, probably owing to immunity acquired in the course of the original infection. In the second volunteer the course of the disease was similar to that described above, but the symptoms were more severe and oöcysts were discharged in the stools for six days longer. In both cases the symptoms disappeared without treatment after termination of oöcyst production. *C. A. Hoare*

COCKBURN, T. A. *Balantidium* **Infection associated with Diarrhoea in Primates.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 291–3.

[A most interesting account.] In June, 1947, at the London Zoological Society's Gardens a *Macaca nemestrina* (pigtail monkey) suffered from

weakness, wasting and loose motions and a heavy infection with *Balantidium* was found. Mepacrine, 0·1 gm. daily, was given, with temporary success but with some difficulty, and carbarsone, 0·26 gm. b.d. was substituted, in tablets, and was eaten greedily with excellent results. Though no *Balantidium* was seen after 3 days, treatment was continued for 12 days.

Examination of 45 Primates in the monkey house discovered 8 infected; four had had diarrhoea for some months. Small animals were given carbarsone in the same dose as the pigtail monkey, the larger ones double this dosage and the diarrhoea ceased in 24 hours. Symptomless carriers were not treated. Three weeks later some of the latter developed the diarrhoeic symptoms, as did also 3 Drills (*Mandrillus leucophaeus*), 3 *Macaca nemestrina*, a *Cercocebus* and a *Cercopithecus*. Again, carbarsone cured the symptoms in 24 hours. The mode of spread could not be determined with certainty; in the monkey house cases "occurred in all parts and not in adjoining cages." Spread may have been by flies. Crab-eating monkeys, *Macacus irus*, were not infected, nor the chimpanzees, but the latter are isolated behind glass. [The author wisely calls his article "*Balandidium* infection *associated with* diarrhoea" [our italics], not "caused by," but the protozoon was probably causative, since the usual causes, dietetic, helminthic and bacterial were excluded.]

H. Harold Scott

RELAPSING FEVER AND OTHER SPIROCHAETOSES

ROUSSELOT, R. & DUVOLON-RAFIN, S., Mme. Sur une souche de spirochètes isolée d'une gerbille iranienne *Tatera indica*. [**A Strain of Spirochaetes isolated from a Persian Gerbil,** *Tatera indica*.] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 7/8, 458–63.

A gerbil caught in the neighbourhood of Teheran and splenectomized, died of an intercurrent infection fourteen days later. The inoculation of an emulsion of the heart, liver and kidneys of this animal into three splenectomized wild mice (*Mus musculus bactrianus*) was followed in them by the appearance of spirochaetes in the circulation after incubation periods of eight or nine days. Two white rats, one splenectomized, were inoculated with the same material and one became infected after fourteen and the other after sixteen days. Attempts to infect guineapigs were negative, but white mice were found to be very susceptible with a mortality of more than 50 per cent. Normal rats were not readily infected, but developed a latent infection which could be detected by inoculation of the brain into mice.

Attempts were made to cultivate the spirochaete in fowl embryos. Eggs were inoculated after 7 days' incubation and examined a week later, when the blood of the embryos was found to be swarming with spirochaetes. After three passages in eggs, the organisms were still virulent to mice; after six passages the results were negative.

The results of cross-immunity experiments show that this strain is distinct from *Spirochaeta duttoni*, but whether it is related to *S. microti*, found by RAFYI in Persian field voles [see this *Bulletin*, 1947, v. 44, 92], or to other strains has not yet been determined.

E. Hindle

LEPROSY

INNES, J. R. **Leprosy in Uganda.** *East African Med. J.* 1948, Oct., v. 25, No. 10, 379–81, 1 map.

The author refers to visits to Uganda by COCHRANE and by MUIR and quotes the former's estimate of leprosy in that country as being 20,000, or 5·4 per thousand of the population.

The present author has recently examined 14,808 people in Uganda and found an incidence of leprosy of 54 per thousand, and he estimates the present number of cases in the whole country as being 100,000. The survey is incomplete, but there is a definite impression that the final figure will be higher than that of Cochrane.

It was possible to examine population samples of 500 or over in areas throughout the country. Co-operation by the people was very satisfactory and the author points to its importance.

Results are shown in a map, in a table of area incidence and in a detailed list of the numbers examined in each place, which varied from 114 to 1,530. The highest incidence was around Fort Portal, Masindi and Arua, in which areas it averaged 117 per thousand. The lowest figures were 6 per thousand in the Entebbe, Masaka and Kampala area and 19·5 per thousand in the Sese Islands.

It is noted that lepromatous cases varied from 15 to 20 per cent. No case seen was under regular treatment. (There are 4 leprosy institutions in Uganda and cases treated by them and other agencies are stated not to exceed 3,000.) No tribe was found exempt, but incidence was heaviest near the Congo Border and less near the Sudan. Segregation is rare (though it appears to have been practised rigidly in the past) and many children are left in house contact with cases of leprosy. Many other diseases were prevalent among those examined and other skin diseases cause diagnostic confusion. Housing is inadequate to prevent the spread of leprosy and the decline in prevalence must partly depend on adequate accommodation with a high amount of cubic space per person. Dietary standards vary greatly and were not correlated significantly with leprosy. The high average humidity over most of the country favours a severe type of the disease: in the few dry areas it is mild and rare. Environmental factors, communications and greater movements of people seem to be aiding a slow increase in leprosy in Uganda. *H. J. O'D. Burke-Gaffney*

MUIR, E **Leprosy in the British West Indies.** *Leprosy Review.* 1948, Oct., v. 19, No. 4, 139–42.

This is a report on a visit during 1948 to the West Indies. Leprosy is a major problem in Trinidad and British Guiana, with about 1,000 cases in each, but less important elsewhere. On visiting the Trinidad leprosarium after three years the author found that under sulphone treatment lepromatous ulcers had nearly disappeared and that lepromatous cases were progressing towards recovery: these would otherwise have reached a hopeless stage. Good results were also observed in Jamaica, with arrest of eye lesions. In British Guiana and elsewhere similar results had been obtained.

Control in the smaller islands was slight because the small numbers isolated do not permit proper care, on financial grounds; so a new policy is advised in their case, namely the abolition of leprosy asylums and trusting to the attractions of present-day treatment in the place of compulsion. For this purpose two of the medical staff of each island should be trained in carrying out the treatment at a suitable centre; they would then be responsible for effective prophylaxis and treatment in their own areas. All immigrants from endemic

countries and contacts should undergo periodic examinations and receive instruction on the dangers of infection to others. Such measures are only advised where the incidence is slight, as being more effective and less expensive under such conditions than compulsory isolation. *L. Rogers*

ROW, R. **Further Observation on Symbiosis of Microorganisms in Culture with special reference to Mycobacterium in Leprosy.** *Indian Physician.* 1948, Oct., v. 7, No. 10, 255–8, 4 figs. (3 coloured) on 2 pls.

The author first states that he has confirmed his isolation in pure culture of acid-fast bacilli from leprosy lesions, in symbiosis with *Leishmania* organisms [see this *Bulletin*, 1946, v. 43, 1147]. He goes on to report attempts at its symbiosis with other non-pathogenic acid-fast bacilli. For this purpose he planted in haemoglobinized saline a few drops of fluid from a leproma, together with a trace of a non-leprous acid-fast bacillary culture, and obtained a mixed growth of long and short acid-fast bacilli forming heaped-up orange-coloured colonies like those of the tubercle bacillus. As it was found to be very difficult to separate the two forms, he cultivated the tubercle bacillus itself in a layer of Sauton nutrient fluid in a flask and introduced into the flask a sterile Pasteur Chamberland filter bougie containing a small fragment of the spleen of a mouse well infected with rat leprosy bacilli, so that the diffusible substances generated in the flask by *Myco. tuberculosis* could reach the rat-leprosy bacilli within the bougie without the latter organism being contaminated. After four weeks at 37°C. the sparingly distributed longish acid-fast bacilli within the bougie were planted out on glycerinated potato, and on Sauton culture fluid for control. After eight weeks a small yellow patch developed on the potato surface as a pure culture of an acid-fast bacillus, now perhaps a little shorter than the original. A control test showed the bougie to be bacteria-proof. The author concludes that " acid fast Mycobacteria can be isolated in culture by symbiosing leprous material with culturable micro-organisms : whether they are *mycobacteria* or *protozoa* in culture makes no difference." How far the cultures thus isolated by symbiosis from the spleen of a mouse infected with rat leprosy bacilli, as also those isolated from human lepromata and rat leprosy by symbiosis with protozoa, will satisfy Koch's postulates is left for future investigation. *L. Rogers*

LOWE, J. ; COCHRANE, R. G. ; FITE, G. L. ; FIDANZA, E. P. ; DHARMENDRA. **The Evolution of Leprosy and Leprosy Control.** [Correspondence.] *Leprosy Review.* 1948, Oct., v. 19, No. 4, 143–54. [14 refs.]

This correspondence records the opinions of several experts on the vexed question of the evolution and control of leprosy and well brings out the present confusion due to various classifications of the disease. LOWE maintains that changes from the tuberculoid to the lepromatous forms are very rare, but in some cases mixed histological changes are seen ; these lesions have a tendency to become lepromatous with negative lepromin reactions. COCHRANE states that " to base the diagnosis of a tuberculoid lesion mainly on histology, will I believe, lead to gross errors." He advises adherence to the Cairo classification. He also holds that there are two clinical types of tuberculoid cases, (*a*) with well-defined lesion sand healing in the centre, and (*b*) with less distinct oedematous edges, frequent reactions and a tendency to become lepromatous with negative lepromin reactions. The latter should be classed as borderland or indeterminate cases. FITE writes on his experience at Carville, U.S.A., where he has seen both tuberculoid and lepromatous appearances together in the same patients, and thinks that they may develop in either direction. He suggests that in early

cases the immunological status may be ill-defined, with some admixtures of types, but as they grow older the lesions become fixed to one type or other. More histological studies of the evolution of early cases are required. FIDANZA of Argentina thinks that the disease always begins as an undifferentiated simple inflammatory lesion and the later development depends on the degree of resistance. The lepromin test provides a valuable aid to classification, the most frequent change being that from a negative lepromatous to a positive reaction after prolonged energetic treatment. No type is immutable, but a direct change from one polar type to another is a rare exception. Dr. DHARMENDRA from his Calcutta studies concludes that a change from tuberculoid to lepromatous type is rare and that the confusion is due to two different interpretations being given to the term tuberculoid, which should be restricted to cases showing only typical tuberculoid histological changes. *L. Rogers*

LOWE, J. **Sulphone Treatment of Leprosy.** *Leprosy Review.* 1948, Oct., v. 19, No. 4, 129–38. [18 refs.]

ALDERSON, S. **Physical Therapy in Leprosy.** *Leprosy Review.* 1948, Oct., v. 19, No. 4, 120–29.

This paper deals with the physical treatment of crippled nerve cases in Nigeria by a B.E.L.R.A. worker; this has hitherto been neglected in British tropical countries, although these constitute a large proportion of advanced leprosy cases in which drugs have little place. In two-thirds of the patients, both arms are usually affected and at the Uzuakoli settlement 378 of 673 examined showed such lesions. Trophic changes were especially common in children, but many of the cases at all ages were in a fairly early stage with only slight wasting. Exercises are of great value in such cases; for the details of these the original paper should be consulted and also for simple forms of apparatus which have been found useful. Heat treatment is also useful and is best applied by means of baths of heated hydnocarpus oil, followed by massage for five to fifteen minutes, consisting of effleurage, kneading and friction applied to the whole hand and later to the ulnar border of the forearm. Active finger exercises follow. Suitable patients were trained to assist in carrying out the treatment after a European expert had examined the patients and given written instructions for it.

Occupational therapy by means of a specially designed simple hand loom proved effective especially in children, who co-operated best. Illustrative cases of the benefits are given. Exercises, based on notes by Dr. RYRIE, for both hands and feet proved of value. When an affected nerve is acutely painful, injection therapy or an operation should precede physical therapy.

L. Rogers

HELMINTHIASIS

COWPER, S. G. **The Effect of certain Inorganic and Vegetable Substances on the English Pond Snail** *Planorbis corneus* **(Linné, 1758).** *Ann. Trop. Med. & Parasit.* 1948, Sept., v. 42, No. 2, 119–30. [20 refs.]

The author tested the comparative molluscicidal effects of a variety of substances by exposing the English pond snail, *Planorbis corneus*, to them in various dilutions and for various durations.

After a review of part of the literature dealing with snail control with special reference to use of copper, the results of tests with certain copper salts are described and tabulated. Copper acetate killed snails in 48 hours at a dilution of 1 p.p.m. ; copper chloride at 5 p.p.m. in 24 hours ; the less soluble copper carbonate was toxic at 5 p.p.m. It is remarked that *P. corneus* appeared to be more resistant than *Bulinus* and *Physopsis* to copper salts, judging by comparison with previous workers' results.

A series of eight different copper ores was also tested against *P. corneus*. These were ground up and samples of 5 gm. were suspended in parachute-silk bags in the vessel containing the live snails. The best result was obtained with ores containing malachite, which proved toxic to snails at a "dilution" of 1·25 gm. per litre. The toxic effect of ores is much less than that of the soluble copper salts, but they are thought to justify further trials in the field.

Extracts and preparations of a number of tropical plants were obtained, mainly by boiling the leaves, and the filtered liquids were tested against *P. corneus*. The action of extracts of *Eucalyptus* and *Sapindus* was almost negligible. In *Balanites*, *Randia* and *Quillaja*, a molluscicidal principle was demonstrated while extracts of *Tephrosia* leaf were effective only in high concentrations over long periods. The effects of saponin (Merck) were variable and in high dilutions had only a slight toxicity to the snails.

J. J. C. Buckley

KIRKALDY-WILLIS, W. H. **Cystoscopy in the Diagnosis and Treatment of Bilharzia Haematobium Infection.** *East African Med. J.* 1948, Sept., v. 25, No. 9, 333–61, 18 coloured figs. on 3 pls. [98 refs.]

The author, since 1941, has been interested in cystoscopy in East African hospital practice ; he has endeavoured to determine the value of this procedure in the diagnosis of urinary schistosomiasis, and its differentiation from the changes in the bladder resultant on other forms of uro-genital disease. He lists in considerable detail, with illustrative cases, the cystoscopic changes observed in Kenya Africans (Mgiriama tribe) suffering from urinary schistosomiasis and from a wide variety of other bladder conditions. Cystoscopy, he concludes, is indispensable in the diagnosis, and as a control after the treatment, of urinary schistosomiasis.

[This paper does not lend itself to summary. It contains a vast amount of information, ranges over a very wide field, and the references are voluminous. It should be consulted in the original by those interested.]

A. R. D. Adams

GELFAND, M. **The Diagnosis of Schistosomiasis.** *East African Med. J.* 1948, Sept., v. 25, No. 9, 367–71. [13 refs.]

A conclusive diagnosis of schistosomiasis is dependent on recovery of the ova of the parasites ; in many cases this is difficult. The intradermal test for diagnosis is not specific, and both false positive and false negative reactions are common ; eosinophilia is of inconclusive value in diagnosis, as is the formolgel test.

Schistosomiasis, due either to *S. haematobium* or *S. mansoni*, should be suspected in those who have been at risk of infection and complain of constitutional symptoms—loss of weight and appetite, dyspepsia, tiredness, flatulence, debility, inability to concentrate, and cough—even in the absence of the classical manifestations of the disease. Examination of single specimens of urine or of stool for ova is usually inadequate ; repeated examinations may be necessary to reveal the characteristic changes occurring in the specimens,

and to demonstrate the presence of ova. *S. mansoni* ova, in Southern Rhodesia, have been found in rectal biopsy snippings in sixty per cent. of those passing eggs in the stools; in some cases of negative stool examination a diagnosis has been established by biopsy. Negative rectal snips and repeated stool examinations indicate reasonably conclusively an absence of *S. mansoni* infection. *S. haematobium* ova will not infrequently be found in rectal snippings, either alone or in association with those of *S. mansoni*, but they are very rarely found in the stools. Forty per cent. of cases of *S. haematobium* infestation yield positive rectal biopsies.

Cystoscopy is of value in the diagnosis of urinary schistosomiasis. Even in the absence of visible abnormality (30 per cent. of cases) bladder biopsies yield *S. haematobium* ova in a high (90 per cent.) proportion of all cases of *S. haematobium* infection. *S. mansoni* ova are very rarely seen on bladder biopsy.

Radiography is a rather neglected method of diagnosis in urinary schistosomiasis. In 15 per cent. of Africans [with *S. haematobium* infection] calcification in the bladder can be seen. The shadow is usually linear; it may be short, narrow, and faint, or it may be a complete circle, resembling a foetal skull. In addition to the linear outline calcified striations or irregular calcified masses may be seen. In a small proportion of cases the ureter, especially in its lower third, can be seen outlined. In Europeans radiographic changes are far less evident, possibly owing to their lighter infestations.

Intravenous pyelography is of limited value, and should be reserved for those cases with suspected ureteric complications; in these it may be found that the ureter is tortuous, elongated, and dilated, usually in its lower half.

A. R. D. Adams

GELFAND, M. **The Diagnosis of Schistosomiasis in Southern Rhodesia by the Rectal Biopsy Technique.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 283–6.

The author discusses the various methods of diagnosis of intestinal schistosomiasis and refers at some length to the literature on the subject, especially in regard to the development of the technique of rectal biopsy. All the papers quoted have been abstracted in this *Bulletin*.

He then gives his own recent experiences with the use of rectal biopsy in the case of young adult Africans in Salisbury, Southern Rhodesia. The cases were divided into (1) those passing *S. mansoni* ova in the stools, but no *S. haematobium* ova in the urine, (2) those passing *haematobium* ova in the urine, but no *mansoni* ova in the stools, and (3) those showing no ova on microscopical examination of stool and urine (usually only one specimen of each was examined).

The patients were prepared as for sigmoidoscopy, with a saline enema (1 pint) beforehand: this rendered examination much more simple. After insertion of the sigmoidoscope a snip was taken from the first right dorsoventral valve: the instrument was passed to the second valve of Houston and another snip taken from there; finally, one or two snips were taken from between the two regions, generally from a haemorrhagic focus or other suspicious area. Bleeding was slight, but the snip was somewhat painful at the time. The snippings, which were only about 2 mm. in size, were teased in water on a slide and examined with a low-power objective.

While the author did not obtain as high a percentage of positive results for *S. mansoni* in the rectum as did other workers, ova were found in most patients passing them in the stools and even in those passing no ova of any kind either in stool or urine. Nevertheless, stool examination should not be omitted, as even when ova are passed, biopsy may be negative.

An interesting feature was the finding of *S. haematobium* ova in rectal snippings alone or with *S. mansoni*. The author points out that ova of *S. haematobium* are often deposited in tributaries of the inferior haemorrhoidal vein. They do not always appear in the stools, but have been reported not infrequently [see this *Bulletin*, 1937, v. 34, 393]. In the author's own experience, less than 3 per cent. of those harbouring *S. haematobium* pass ova in the stools. He has, however, found ova of this species in 77 digested rectal specimens from 102 cases proved at autopsy to have vesical schistosomiasis. It is thus not surprising that these ova may be found in rectal snippings in cases of urinary schistosomiasis.

In the present series, the author found ova in rectal snippings of 32 of 38 patients in group (1) above; 17 showed *mansoni* ova alone, 8 were double infections and 7 were *haematobium* alone.

Fifteen patients in group (2) revealed 7 instances of ova in the snippings: all contained *S. haematobium* ova and two also contained *mansoni* ova.

Of 18 patients in group (3) 7 showed ova in the snippings: two were those of *S. mansoni* and five of *S. haematobium*.

The author considers that the biopsy technique is of added value in areas such as Rhodesia where both types of schistosome infection are present [see also GELFAND, this *Bulletin*, 1949, v. 46, 56]. *H. J. O'D. Burke-Gaffney*

PIFANO C., F. La infección uni-sexual producida por *Schistosoma mansoni* en condiciones experimentales. [**Unisexual Infestation in Experimental** *Schistosomiasis mansoni*.] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 63–72. [11 refs.] English summary.

It has often been reported and even confirmed experimentally that all the schistosome cercariae coming from a single miracidium are of the same sex. The author used for his experiments white mice and cercariae from *Australorbis glabratus*, the intermediate host of *S. mansoni* in Venezuela, in the dry season. He infected 26 animals, exposing them to 18 of these snails and later found no ova in the liver, 590 males in the portal veins, 32 of "undetermined sex"; otherwise no females. It is argued from this that larval forms potentially masculine are more resistant during the dry season and that "human infestations acquired at such seasons are due to larvae predominantly, if not solely, male." Next, 20 of these animals were subjected to infection by 10 snails taken during the rainy season. When examined later, the liver was crowded with ova; in the portal vessels were 205 males, 187 females, and 16 not determined. Induction analogous to the above would be that the rainy season favours the production of larvae potentially female and that human infestation at such a period is likely to be both male and female.

The experiment was then carried a stage further. Five animals were subjected to cercariae from *Australorbis glabratus* collected during the rainy season. All five, when examined later, showed many ova in their livers and both male and female worms in the portal vessels; altogether 174 males, 147 females and 20 "not determined." Four animals were then subjected to infection by snails of the same batch which had been in the interval exposed to the sun for 10 days during which the volume of the fluid containing them had been reduced to half by evaporation. When examined later, one of the animals had a few ova in the liver, the other three had none; the first had 42 males and 10 females in the portal vessels, the others 23, 47 and 36 males respectively, but no females. [A study of much interest.] *H. Harold Scott*

JAFFÉ, R. Anatomia patologica y patogenia de la bilharziosis mansoni en Venezuela. [**The Pathogeny and Morbid Histology of Infestation by** *Schistosoma mansoni* **in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 32-62, 29 figs. [33 refs.] English summary.

The author describes in minute detail the pathological anatomy and histology of the lesions produced in the different organs and tissues by the presence of *S. mansoni* and its ova—in the liver, the lungs, the myocardium, etc.—and these are well shown in a series of photomicrographs. These are described in all reputable textbooks on tropical medicine and pathology and the knowledge is common to readers of this *Bulletin.*

In his discussion of the pathogeny the author breaks new ground. There is the local inflammatory reaction due to the presence of ova, but in addition there is a tissue reaction against toxic excretions of the parasite or its eggs, direct or by way of allergy, and this last may arise from allergy to the parasitic toxins or to products of the injured tissue. The myocarditis is thus attributed, and the cirrhosis of the liver, apart from the more localized pipe-stem cirrhosis, may be due to similar allergic reactions. Other lesions result from local accumulations of ova leading (in the intestine, for example) to necrosis and ulceration, but this seems to be uncommon in Venezuela, though reported as frequent in other countries. In Venezuela, the results in the large intestine are the production of a catarrhal condition with small haemorrhages.

H. Harold Scott

MAYER, M. Consideraciones sobre el tratamiento de la bilharziosis con preparados del antimonio (por las vias intravenosa, intramuscular, oral y rectal). [**The Treatment of Schistosomiasis with Antimony, Intravenously, Intramuscularly, Orally and Rectally.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 120-43. [63 refs.] English summary (4 lines).

The author introduces the subject by saying that his colleagues have asked for his opinion on the treatment of schistosomiasis by antimonials, so he is publishing observations based on what he has seen abroad. "It is not by any means my intention," he states, "to criticize the various forms of treatment adopted by medical experts." Then follows a discursive account of the use of antimony in tropical medicine. The first half deals with the use of tartar emetic in kala azar; the second reviews this salt, and fouadin and anthiomaline in the treatment of schistosomiasis. The opinions of more than 50 authors who have written during the past 30 years on the dosage and intervals between doses are quoted, but no original view is vouchsafed nor any account of original work.

H. Harold Scott

ABDOU, S. & GRACE, H. K. **Observations on the Late Results of Splenectomy for Bilharzial Splenomegaly.** *J. Roy. Egyptian Med. Ass.* 1948, Oct., v. 31, No. 10, 786-91, 4 figs. & 1 map. [11 refs.]

Splenomegaly due to *Schistosoma mansoni* infection is common in Egypt. In 3,589 major operations performed at the Kasr El-Aini Hospital in the year 1936/37 there were 167 (4·65 per cent.) splenectomies. In a village in Dakahlia province 344 persons between the ages of 8 and 20 years were examined for schistosomiasis and for splenomegaly; of these 269 (78 per cent.) had schistosomiasis, and 100 (29 per cent.) had splenomegaly. Of the 100 with splenomegaly, 89 had schistosomiasis (84 *S. mansoni*, and 5 *S. mansoni* and *S. haematobium*); in the remainder no evidence of the infections was found. Treatment

with tartar emetic produced some shrinkage of moderately enlarged spleens, and improvement in the general condition of these patients ; and the pellagra from which some of them suffered disappeared as a result of it.

Observations were made on 42 patients splenectomized for splenomegaly from one year to 25 years previously (in 7 only of these cases was the diagnosis of schistosomiasis established microscopically). Thirty-five of the patients were operated on by one of the authors, during the last 10 years ; of these, 30 are still alive. Of the 5 that have died, one died of portal thrombosis on the fourth day, and four survived for two years, after operation. Seven patients who had been operated on by other surgeons during the last 25 years were seen. Of these one died recently of carcinoma of the liver 25 years after splenectomy. The general results of splenectomy were good ; the lassitude and anaemia from which the patients suffered disappeared, and their nutrition and working capacity were restored ; health was maintained, in the absence of reinfection. The desirability of tartar emetic treatment in the early stages of splenic enlargement is emphasized ; it is important to give a course of tartar emetic treatment pre-operatively ; and re-treatment is necessary in the event of reinfection of individuals who have been splenectomized. *A. R. D. Adams*

BAUMAN, P. M., BENNETT, H. J. & INGALLS, J. W., Jr. **The Molluscan Intermediate Host and Schistosomiasis japonica. II. Observations on the Production and Rate of Emergence of Cercariae of** *Schistosoma japonicum* **from the Molluscan Intermediate Host,** *Oncomelania quadrasi*. *Amer. J. Trop. Med.* 1948, July, v. 28, No. 4, 567–75, 1 fig. & 1 graph.

" This investigation was conducted in order to obtain greater numbers of naturally shed cercariae for use in the laboratory of the Commission on Schistosomiasis in the Philippine Islands. The observations and experiments performed provided the following observations :

" 1. Alkaline water (optimum *p*H 7·6) was a critical factor in the natural release of cercariae of *Schistosoma japonicum* from the molluscan host, *Oncomelania quadrasi* on Leyte.

" 2. Temperature variations of the water, between 19° and 30°C., did not influence the release of cercariae from the naturally infected host, *Oncomelania quadrasi*.

" 3. Artificial illumination and darkness were similarly unimportant factors ; however the natural release of cercariae is of a definite nocturnal periodic nature. Cercariae were released in significant quantities throughout the early evening and continued emerging after midnight, with the peak of production occurring from 9.00 to 11.00 p.m., steadily decreasing as daylight approaches.

" 4. Naturally infected *Oncomelania quadrasi* will liberate cercariae on two to three successive nights, and then an equally long period will pass before any considerable number of cercariae will emerge. Not a single known positive *O. quadrasi* under observation for 30 days discharged cercariae consistently for more than three consecutive days, thus indicating that the natural emergency of *S. japonicum* cercariae from this molluscan host is of a cyclic nature."

MAO, C. P. & LI, L. **A Note on the Morphology of** *Schistosoma japonicum*. *Proc. Helminthological Soc. of Washington.* 1948, July, v. 15, No. 2, 77–9, 1 fig.

" As a result of the examination of several hundred adult *Schistosoma japonicum*, including 15 Japanese and 92 Philippine specimens, it is concluded that the length of the common caecum constantly occupies the posterior third of the body and the number of testes is invariably seven. Two exceptions in

the number of testes and several instances in peculiar morphology of the intestine are also reported."

ARENAS, R., ESPINOSA, A., PADRÓN, E. & ANDREU, R. M. Fascioliasis hepatica con caracter de brote epidemico. [*Fasciola hepatica* **Infestation as an Epidemic Outbreak.**] *Rev. Kuba Med. Trop. y Parasit.* Habana. 1948, Apr.–May, v. 4, Nos. 4/5, 92–7.

In 1944 the authors were called upon to investigate cases of a disease characterized by digestive and hepatic symptoms accompanied by a high eosinophilia, occurring in San Cristóbal, in the Province of Pinar del Rio. One doctor there had more than 40 such patients. Examination by the duodenal sound resulted in the finding of ova of *F. hepatica*. The patients were accustomed to consume a good deal of watercress and examination of this showed the presence of *Physa cubensis* and *Lymnaea cubensis*, intermediate hosts of *F. hepatica*.

Later, in 1947, in Pinar del Rio a "new disease" was reported the main symptoms of which were spasms of coughing and a high eosinophilia, thought to be due to filtrable virus. With assent of 20 local doctors, the authors went to the district with a view of seeing cases for themselves. The early symptoms were digestive and biliáry, later pulmonary, cutaneous and nervous. They studied 52 patients. The usual history given was of pain in the abdomen, mostly in the epigastrium, with fever to 39–41°C., shivering and sweats; the pain persisted, with intermissions, for several days, the fever, shivering and sweating, worse in the afternoon and evening, also persisted, with remissions. Many complained of weakness, joint and muscle pains and allergic symptoms such as urticaria, pruritus and asthmatic attacks. Headache, insomnia, constipation and diarrhoea, together with a dry cough and a yellow discoloration of the skin were other symptoms, not always present.

Analysis of the cases showed that all the patients suffered from the abdominal pain in epigastrium or right hypochondrium; 45 had fever, intermittent or remittent, perhaps continuing for months; 43 had anorexia, 39 weakness more or less marked; 38 had enlargement of the liver, but not great except in a few; 33 had urticaria. Blood examination showed red cells between 3,200,000 and 5,140,000 per cmm. with an average of 4,033,000; leucocytes ranged between the wide limits of 5,000 and 41,500, with an average of 16,500; eosinophiles might be as high as 81 per cent., but the average was 35. The duodenal sound was used in all 52 patients and ova of *F. hepatica* were present in 22 of them, the amount of bile obtained being from 80 to 300 cc. Failure to find ova is ascribed, first, to the fact many were early cases and the parasites had not reached maturity; second, emetine hydrochloride had already been given. This had been done in nine patients. Forty-eight of the 52 owned to having eaten the suspected watercress. *H. Harold Scott*

KOURÍ, P. Diagnóstico, epidemiologia y profilaxis de la Fascioliasis hépatica humana en Cuba. [**Diagnosis, Epidemiology and Prophylaxis of Infestation by** *Fasciola hepatica* **in Cuba.**] *Rev. Kuba Med. Trop. y Parasit.* Habana. 1948, Apr.–May, v. 4, Nos. 4/5, 77–87, 7 figs. [52 refs.]

Diagnosis of *Fasciola hepatica* infestation on clinical grounds is not very definite or conclusive; the symptoms of angiocholitis, and cholecystitis are common to bacterial infections of the bile-ducts and gall bladder and to gallstones. Finding of the ova in the faeces is confirmatory, but they may be sparse and missed unless bile is obtained by the duodenal sound. Occasionally they are seen unexpectedly at operation or are not found until autopsy reveals

the presence of the worm. One symptom on which the author lays much stress is prolonged fever with high eosinophilia. Outbreaks of this have occurred in Pinar del Rio and Las Villas. Laboratory diagnosis (apart from finding the ova in faeces or bile) includes biological reactions, intradermo-reaction with extracts of the trematode, precipitin tests and deviation of complement, but these have not been long enough on trial to afford reliable evidence; the therapeutic test—the result of emetine treatment—is fallacious because it is equally efficacious in amoebic hepatitis [see this *Bulletin*, 1948, v. 45, 799].

Epidemiologically, the Provinces of Pinar del Rio and Las Villas have furnished most cases; Havana and Matanzas some, but fewer. The author suggests the estimation of four indices for determining endemicity: 1, The *Hepatic-Fasciola Index*—the percentage of slaughtered cattle found infested. 2, The *Ova-faeces Index*—the percentage of cattle passing the ova, in ranch and dairy herds, etc. 3, The *Malacological Index*—the percentage of *Physa cubensis* and *Lymnaea cubensis*, which act as intermediate hosts, among the total snails and molluscs examined. 4, The *Cercarial Index*—the percentage of these intermediate hosts found infected with sporocysts, rediae and cercariae.

Prophylactic methods follow naturally from the foregoing and would comprise treating infested persons and cattle; boiling and filtering the drinking water, avoiding raw fruit and vegetables from infested regions, destruction of the intermediate snail hosts. The article has a bibliography of 52 references, 33 of which are by the author himself or with colleagues who have made fascioliasis in Cuba a special study. *H. Harold Scott*

LEÓN, L. A. La raillietinosis es una endemia en el Ecuador. Nuevo aporte al conocimiento de la Raillietina (Raillietina) Equatoriensis. [**Infestation by *Raillietina* in Ecuador. Fresh Contribution on *Raillietina equatorius*.**] *Bol. Sanidad.* Quito, Ecuador. 1947, Jan.–Feb., v. 3, Nos. 1/2, 41–9, 3 figs. [18 refs.]

There are several species of *Raillietina* which may infest man. *Davainea madagascariensis* [occurring not only in Madagascar but also in Siam, British Guiana, Formosa and the Philippines] normally a parasite of birds; *R. cubensis* (later named *Inermicapsifer*) found among children in Cuba, are two. In Ecuador, says the author, there are 6 or 7 species [elsewhere he states "five new species"]. Their intermediate hosts are not yet determined, but may be small molluscs or beetles. They are common in the Province of Pichincha and they infest all races, white, coloured and half-caste, and adults as well as children; usually 6–8 worms are found in a patient. They set up gastro-intestinal symptoms such as nausea, anorexia, colic and dysentery; nervous symptoms, headache, dulness, epileptiform or syncopal attacks and "change of character", and circulatory disturbances such as pallor, anaemia, sometimes with slight eosinophilia, praecordial pain and arrhythmia. Treatment by Filix mas or by carbon tetrachloride gives quite satisfactory results.

The author gives a detailed description of *R. equatoriensis*. It has a pear-shaped scolex, 500–700μ by 460–580μ, with a retractile rostrum armed with a double row of hooklets, about 70 in number and 15–18μ long, and 4 suckers with an edging of three or four rows of small goad-like hooklets (*aguijones*). The proglottides are nearly all broader than they are long, till the gravid segments are reached. The genital pores are unilateral, with an occasional one on the other side; the testicles vary in number from 50 to 75, the ovary is a more or less solid lobule, 0·5 mm. with 250–300 oviform capsules each containing 7–10 ova, most commonly eight. The ova are elliptical, 41–44μ long by 32–35μ wide, with two envelopes and very like the ova of *Hymenolepis nana*. *H. Harold Scott*

RISQUEZ-IRIBARREN, R. & ORTIZ C., I. Consideraciones con motivo del segundo caso de *Hymenolepis diminuta* en Venezuela. [**Remarks on the Second Case of Infestation by** *Hymenolepis diminuta* **in Venezuela.**] *Rev. Policlinica Caracas.* 1947, July–Oct., v. 16, Nos. 95/96, 201–14. English summary (7 lines). [32 refs.]

In 1919 CUENCA reported that a child in Caracas, a patient of Dr. Risquez, passed a worm which was identified as *H. diminuta*. This appears to have been the first recorded instance of this infestation in Caracas and that it is rare is evidenced by the fact that not until 1945 has another case been observed. This was in a child who was being treated for parasitism by *Ascaris*, *Trichuris* and *Necator*. The cestode passed was sent to the Smithsonian Institute at Washington where the diagnosis of *H. diminuta* was confirmed.

The remainder of the article consists of records by various authors who have examined faeces in considerable numbers during the past 25 years or so and the localities concerned, and gives in tabular form the numbers and percentages of *T. solium*, *T. saginata* and *H. nana* found—matters of local rather than of general interest.

H. Harold Scott

HUNG, See-Lü & LI, Fei-Pai. **On the Egg Discrimination, Larval Culture and Infection Course of** *Trichostrongylus orientalis*. *Chinese Rev. Trop. Med.* 1948, Jan., v. 1, No. 1, 1–5, 1 fig.

In 500 cases of ancylostomiasis which were diagnosed at Pehpei, the eggs of *Trichostrongylus* were found in 41 patients, all of whom were natives of districts in the lower valley of Fu-Kiang. A preliminary survey in these districts revealed a prevalent infestation with *Trichostrongylus*, ranging from 28·12 to 49·16 per cent. The abundant material provided by this survey enabled the authors to give a detailed account of the methods of differentiating eggs of *Trichostrongylus* from those of *Ancylostoma*; to devise a method of culturing *Trichostrongylus* eggs for the purpose of obtaining infective larvae; and to carry out experimental infections of rabbits with the larvae.

Measurements of 200 eggs of *Trichostrongylus* and *Ancylostoma* gave the averages $90{\cdot}94 \times 45{\cdot}12\mu$ for the former and $64{\cdot}89 \times 40{\cdot}46\mu$ for the latter. It is remarked that not only are the general dimensions different, but the length-width ratio is distinctive in the two species, for in 57·5 per cent. of the *Trichostrongylus* eggs the length is twice as great as the width whereas in 100 per cent. of *Ancylostoma* eggs the length is less than twice the width. Colour, shape, shell-thickness and degree of development of freshly-passed eggs are also contrasted.

A rather elaborate method of culturing faeces for infective larvae is described, which cannot be dealt with in detail in this abstract.

Experiments on the infection of rabbits with larvae of *Trichostrongylus* were carried out both orally and cutaneously. The oral method proved to be outstandingly the more effective of the two and it is suggested that human infection with *Trichostrongylus* may also be more readily incurred by oral ingestion of the larvae.

J. J. C. Buckley

STRANG, C. & WARRICK, C. K. **Radiological Demonstration of Ascaris Infestation.** *Brit. J. Radiol.* 1948, Nov., v. 21, No. 251, 575–8, 4 figs.

For the diagnosis of ascariasis, radiography is seldom necessary, but it may be of value when for some reason, *e.g.* delayed parturition or the presence of male worms only, ova are absent from the stools. The worms are easily

demonstrable by serial radiographs of the abdomen at half-hour intervals. They may also be discovered accidentally during a barium meal examination for some other condition.

" The radiological signs are : (1) sharply defined band-shaped filling defects ; (2) linear shadows due to adherence of barium to the exterior of the worm ; (3) thread-like shadows caused by the presence of barium in the enteric canals of the worms ; and (4) evidence of disordered motility of the bowel."

The case of a ship's officer who stated that he had passed round worms in his stools is reported. He was symptom-free and had no eosinophilia. Ova were found in his stools. Two courses of hexylresorcinol (1 gramme) followed in two hours by an ounce of saturated sodium sulphate on an empty stomach produced no worms. Two months later he still had ova in the stools. He was given 4 ml. of tetrachlorethylene and 1 ml. of oil of chenopodium, after which he produced 5 dead *Ascaris* and subsequent stool examinations were negative.

He was examined radiologically before any treatment and after the hexylresorcinol. All the above-mentioned signs were demonstrated. At the second examination the worms were not demonstrated until the 5½-hour examination when a filling defect was observed in the ileum. At 6 hours, barium was still adherent to the worms. [There are 4 very convincing illustrations of radiographs.] *L. E. Napier*

WILSON, T. **Bancroftian Filariasis.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 305–8.

This is a note by way of comment on Clayton LANE's article [this *Bulletin*, 1948, v. 45, 802].

The author considers that conclusive proof of nightly parturition has yet to be found and that the facts could equally well be explained by the existence of a much longer period of gestation, expressed in days or even weeks, but combined with a fair degree of synchronization between the adult worms and with expulsive parturition.

The evidence in favour of nightly birth and daily death of microfilariae is as yet not sufficiently conclusive.

The author notes that the youngest reported blood infection was a child of 14 months, but he himself discovered a child of 13 months infected with *W. malayi*. *P. Manson-Bahr*

MONTESTRUC, E. A propos de l'index filarien à la Martinique (*W. bancrofti*) et de la lymphangite endémique de pays chauds. [**The Filaria Index in Martinque** (*W. bancrofti*) **and Endemic Lymphangitis of Warm Countries.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 5/6, 372–3.

FLOCH and LAJUDIE [this *Bulletin*, 1947, v. 44, 922] state that they cannot accept the filarial aetiology of tropical lymphangitis ; this conforms with the present author's opinion expressed twelve years ago [this *Bulletin*, 1936, v. 33, 127] in which he suggested that the filaria only plays a preparatory rôle by damaging the lymphatics.

The percentage findings in microfilaria surveys, by various workers, in Martinique through the last twenty-five years have been 5·47 in 1913, 27·37 in 1917, 18·6 in 1934, 1·75 in 1936 and 14·3 in 1945. He discusses the significance of these variations.

In the discussion, Dr. H. GALLIARD pointed out the fallacy of accepting the microfilaria index as evidence of the extent of filarial infection in a locality and quoted the American experience in which biopsies showed adult filariae in

many persons who had no microfilariae in their blood. The figures quoted above were also subject to variations of technique, to selection of population groups, and to the effects of patchy distribution.

On the subject of aetiology of lymphangitis of warm countries, he said it was not a question of being exclusively caused by bacterial infection or exclusively an allergic or a toxic manifestation : it was a question of the stage of development. The worm causes a loss of vitality of the local tissues and complications follow. It was possible that tropical lymphangitis was a distinct clinical entity, but that it was necessary to prove that no adult filariae were present ; the absence of microfilariae was not sufficient. Again, it was a fallacy to suggest that because lymphangitis was uncommon in certain filaria-endemic areas, it was not associated with filariasis. In different regions different clinical manifestations were found to predominate : this was possibly a human factor, as suggested by Buxton, or a parasitic one, there being different biotypes of filariae of which *W. malayi* was an example. *L. E. Napier*

STEFANOPOULO, G. J. & SCHNEIDER, J. Essais de traitement de la filariose à *F. loa* par la 1-diéthyl-carbamyl 4-méthylpipérazine. [**Treatment of** *Loa loa* **Infections with Hetrazan.**] *C. R. Soc. Biol.* 1948, July, v. 142, Nos. 13/14, 930–31.

Hetrazan (1-diethyl-carbamyl-4-methylpiperazine) has been used with success in the treatment of human filariasis (*Wuchereria bancrofti*) by SANTIAGO-STEVENSON and his colleagues [this *Bulletin*, 1948, v. 45, 353]. The results obtained encouraged the authors to try this drug in filariasis due to *Loa loa*.

They used it (the citrate salt) in the treatment of 20 cases of *Loa loa* infection of variable duration and symptomatology. In three cases, the essential symptom was obstinate pruritus. There was always an eosinophilia, from 15 to 60 per cent. In seven cases, microfilariae were found in the peripheral blood and in all the other cases the clinical diagnosis was confirmed by the intradermal test. The patients were all adults.

The dosage given was 3 to 6 mgm. per kilogramme body-weight, daily, by mouth, for 7 to 10 days. Within the first hours of treatment some subjects showed superficial reactions, a sensation of subcutaneous "creeping," temporary exacerbation of pruritus, or fugitive oedema, and in one case a generalized erythema. Rarely, there were a generalized reaction, nausea, arthralgia, diarrhoea and fever ; all these reactions disappeared within 48 hours.

Within 48 hours all symptoms disappeared : in some cases, especially where there was pruritus, the improvement was spectacular. At the same time the microfilariae disappeared from the peripheral blood. In one case only were they found after 7 days of treatment. The worms tended to appear under the skin or mucous membranes (conjunctiva) and were sometimes eliminated spontaneously, or the dead worm formed a subcutaneous nodule without any oedema.

In some cases the symptoms disappeared for 2 to 4 months, but more often the improvement was transitory and after a few weeks of remission the symptoms returned in a less severe form. However, in nine cases it has been possible to effect an apparently complete cure by giving 2 to 4 courses of treatment of daily doses of 0·4 grammes for 10 days each, with intervals of 3 to 4 weeks between the courses.

The authors have had experience in the treatment of filariasis for 15 years, but this is the first drug that has given consistently good results.

L. E. Napier

TRENT, Sophie C. **Anthiomaline and Neostibosan in the Treatment of Filariasis** (*Dirofilaria immitis*). *Puerto Rico J. Pub. Health & Trop. Med.* 1948, Mar., v. 23, No. 3, 311–60, 3 charts & 17 figs. [Spanish version 361–92.] [Refs. in footnotes.]

After treatment with anthiomaline, a tervalent Sb compound, reduction or disappearance of microfilariae in various filarial infections has been reported [this *Bulletin*, 1940, v. 37, 656 ; 1941, v. 38, 151 ; 1945, v. 42, 53]. The effect of this drug on the microfilariae and adult forms of *Dirofilaria immitis* in the naturally infected dog was therefore investigated. After microfilarial counts had been performed in 6 dogs for some days to note the variations in numbers present, the animals were treated with 0·8 mgm. Sb per kilo intravenously till the parasites disappeared from the blood, which occurred in 10 to 22 days. The dose of Sb required to cause disappearance appeared to be unrelated to the numbers of microfilariae originally present. Two further doses of the drug were then administered and over a subsequent period of 12 weeks no parasites were found in blood. Changes in their structure or motility had not been observed during treatment. Six other naturally infected dogs served as controls in these experiments. In one treated dog autopsy was performed 2 days after disappearance of microfilariae, and fragmented forms of the latter were found in the tissues of blood vessels, in lungs and in kidneys, apparently being ingested by phagocytes. The drug, which was non-toxic in the above doses, therefore appeared to be rapidly effective against these young forms. The chief pathological lesions found in the remaining 5 dogs were in lungs and kidneys. Of 36 adult worms found, however, only 10 were dead and in them few pathological lesions were present. Developing forms, however, were generally absent from the uteri, and, in the male, spermatozoa appeared to be affected. The authors doubt the value of anthiomaline against the adult worms.

Neostibosan, a pentavalent Sb compound, has also been stated to be active against various microfilariae [this *Bulletin*, 1940, v. 37, 656 ; 1945, v. 42, 136 ; 1946, v. 43, 54]. Its effect was therefore studied as above in the same infection in 6 dogs. In a first course of therapy, 10 mgm. Sb per kilo were given five times weekly—total 14 doses. At the end of 11½ weeks, microfilariae were still present but in greatly reduced numbers. Re-treatment was begun, toxic symptoms became apparent and were followed by the deaths of some dogs. At the end of a further period of 12 weeks microfilariae were absent from the blood. Results showed, however, that neostibosan was not effective against the adult worms, since 63 of 76 worms found at autopsy were motile, and ovaries and testes were normal. *J. D. Fulton*

DUBOIS, A. Notes sur la répartition de *D. streptocerca* autour de Pawa (Nepoko). [**Distribution of** *Dipetalonema streptocerca* **in Pawa.**] *Ann. Soc. Belge de Méd. Trop.* 1948, June 30, v. 28, No. 2, 151–3.

As a result of skin examinations on limited numbers of individuals from various localities in Pawa, the author concluded that infection with *Dipetalonema streptocerca* has a wide distribution in that region and that it occurs in a variety of different kinds of country, including forest, wooded savannah and more arid savannah and in marshy country. The most widely distributed biting insect is *Culicoides* ; *Mansonioides* is common in some places and less common in others, while *Simulium* is absent or rare in the greater part of the region. Dissection of small numbers of *Culicoides* and *Mansonioides* proved negative, but *Culicoides* is suspected to be the transmitter. *J. J. C. Buckley*

PERRY, W. L. M. **A Case of Dracontiasis.** [Memoranda.] *Brit. Med. J.* 1948, Dec. 25, 1107.

An African male of 26 presented with a painless lump in the left groin, of 4 years' duration. Examination revealed a small easily reducible indirect inguinal hernia, not extending into the scrotum. No parasites were found in blood films, but there was an eosinophilia of 8 per cent.

At operation, the grossly thickened and fibrosed hernial sac was found to contain part of a female guinea-worm ; the head and some 5 cm. of its body were free in the lumen of the sac, the remainder being embedded in the wall. The worm was drawn out intact by steady traction. Convalescence was uneventful.

The unusual site of infestation caused a careful identification of the worm to be made. It was 23·7 cm. in overall length, with a mean diameter of 1·4 mm. The body was an elongated cylindrical cord with a rounder anterior end and a hooked posterior end. The mouth parts and genitalia were typical of *Dracunculus medinensis*. The worm did not appear to be gravid and no male was found.

Despite its smaller size, the worm was otherwise characteristic of *D. medinensis*. There seems to be no previous record of this worm occurring solely in a hernial sac.

H. J. O'D. Burke-Gaffney

DEFICIENCY DISEASES

NICHOLLS, L. **The Signs of Malnutrition and the Significance of them in Public Health Practice.** *Med. J. Malaya.* 1948, June, v. 2, No. 4, 247–50.

Extreme and florid forms of malnutrition such as beriberi and pellagra have recently received much attention from clinicians and research workers, as have such subjective manifestations as " burning feet " and night-blindness. There are a number of relatively minor blemishes, found in high incidence among the malnourished, which may readily be detected in rapid examinations and which can provide valuable information in clinical survey work.

The aetiology of these minor signs, affecting mainly the skin, eyes and mouth, is as yet by no means certain, as multiple deficiencies and even non-nutritional causes may contribute to their production.

Among the signs most frequently attributed to vitamin A deficiency are thickening of the bulbar conjunctiva with or without Bitôt's spots, keratomalacia and follicular keratosis. Among the manifestations believed to be due to deficiency of riboflavin and allied factors are hyperaemia with vascularization of the cornea, cheilosis, angular stomatitis and a variety of tongue changes.

Hypochromotrichia, dry staring hair, xerotic and mosaic skin and folliculosis are signs almost invariably associated with malnutrition, but of which the exact interpretation is still obscure.

The author emphasizes that, even in the case of a sign known to be usually associated with a specific deficiency, there may be other contributory causes which may alter the clinical picture.

[There is one point in this valuable paper with which some clinical nutritionists will disagree ; the term " permanent goose flesh " is suggested as synonymous with " phrynoderma ". This was clearly not the intention of the original proposer of the term (PLATT, *Brit. Med. Bull.*, 1945, v. 3, 179) and the two conditions are certainly clinically, and probably aetiologically, distinct.]

Dean A. Smith

DAWSON, J., FINDLAY, G. M. & WARD, R. D. **A Note on Vitamin B Complex Deficiency States among Africans in the Gold Coast.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 277–82, 1 graph.

Five cases of optic atrophy, apparently of nutritional origin, occurred among African soldiers who, for prolonged periods, had lived predominantly upon white rice instead of on their usual diet of cassava, yams, or millet. All had impaired visual acuity, changes in appearance of the fundus and grossly contracted peripheral fields; one had generalized polyneuritis. Biochemical investigations revealed increased level of bisulphite-binding substances (B.B.S.) in the urine and a low vitamin B_1 excretion.

These findings stimulated investigation into nutritional status of other Gold Coast soldiers and groups of the civil population. Slight evidence of optic atrophy was found in two other soldiers who had also been living on a rice diet, with associated biochemical evidence of vitamin B_1 deficiency. There was a satisfactory response to high dosage of vitamin B_1.

Although numerous stigmata of B complex deficiency were found in African civilians, no cases of optic atrophy were discovered.

The soldiers living on a diet of the pattern normally consumed in the Gold Coast were free of deficiency signs, which suggests that it is possible to construct a satisfactory diet from locally available foodstuffs.

[There seem to be important differences between the syndrome here described and that which occurred commonly in the Far East, particularly among prisoners of war. In the latter cases contraction of the peripheral field was absent and the characteristic field defect was a central or paracentral scotoma. Vitamin B_1 was found to be ineffective in treatment even of early cases; SMITH (this *Bulletin*, 1947, v. 44, 604) described the occurrence of amblyopia in over 30 patients who were under treatment with vitamin B_1 for beriberi at the time of onset. Moreover, in most of the groups studied, there was a far closer relationship between amblyopia and such deficiency manifestations as oro-genital syndrome and "burning feet" than between amblyopia and beriberi.] *Dean A. Smith*

BURGESS, R. C. **Some Aspects of Malnutrition in Malaya.** *Med. J. Malaya.* 1948, June, v. 2, No. 4, 239–46, 5 figs.

Malnutrition is one of the most important causes of ill-health in Malaya. The incidence of deficiency diseases was extremely high during the Japanese occupation, but there has been satisfactory improvement since 1945, though in some respects, particularly in the case of beriberi, this improvement can only be regarded as due to artificial and transitory circumstances, mainly the importation of Australian wheat.

Surveys have recently been undertaken of nutritional status in rural areas in Malaya, embracing clinical, dietary, sociological and economic aspects of the problem. Data derived from clinical examinations, height and weight data and vital statistics indicate deficiency in almost all nutrients, and these are confirmed by dietary survey.

Poverty is the main cause of the poor dietary intake. Investigations have shown that protein and calorie intakes are directly related to the money available in the family for expenditure on food. Vitamin A and riboflavin intakes are, on the other hand, largely uninfluenced by economic factors and their deficiency in the diet is mainly a matter of ignorance, prejudice and the unavailability of foodstuffs rich in these nutrients.

As the economic side of the survey showed that the money spent on food, in most families, is over 80 per cent. of the total expenditure, the problem is

clearly an economic one, and can only be solved by country-wide measures of increased and better food production, education and economic betterment.

Dean A. Smith

SPRUE

PREUSS, J. **Sprue: Diagnosis and Differential Diagnosis.** *Indian Physician.* 1948, Oct., v. 7, No. 10, 265–72.

BENAIM PINTO, H. & ARENAS, J. V. Investigaciones sobre el sprue en Venezuela. Nota preliminar. [**Preliminary Study of Sprue in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1948, Jan., v. 1, No. 1, 144–80, 13 figs. [22 refs.] English summary.

A survey was made in Venezuela for possible cases of sprue and it was found to be present where it was thought not to exist.

In one case especially, which was studied in detail, the authors found macrocytic anaemia, with megaloblastic marrow, steatorrhoea, cachexia, glossitis, asthenia, and oedema, flat glucose tolerance curve, normal bilirubinaemia and normal gastric acidity. The jejuno-ileum was filled with gas and skiagraphy presented the picture of marked dilatation with abnormalities of the mucous folds. These symptoms appeared in a hitherto apparently healthy young woman after delivery. In association with sprue, the authors found two other syndromes: one a mild chronic nephritis, the other an enlargement of the liver, probably due to previous amoebiasis or schistosomiasis mansoni.

P. Manson-Bahr

GARCIA LOPEZ, G., MILANES, F., LOPEZ TOCA, R., ARAMBURU, T. & SPIES, T. D. **The Maintenance of Patients with Tropical Sprue by means of Massive Doses of Synthetic 5-Methyl Uracil (Thymine).** *Amer. J. Med. Sci.* 1948, Sept., v. 216, No. 3, 270–74, 4 figs.

It has now been amply demonstrated that synthetic 5-methyl uracil (thymine) is capable of producing clinical and haematological response in patients with pernicious anaemia, nutritional anaemia and tropical sprue. It appears to have no special advantage over folic acid, and is effective only in several thousand times the dosage. Neither is it effective in preventing the onset of subacute combined degeneration of the cord in Addisonian pernicious anaemia, nor is it effective in retarding this process when once it has been initiated. The present study concerns itself with the maintenance of three selected patients, suffering from tropical sprue in relapse, for at least one year after the administration of large doses of thymine.

Three white Cubans (2 males and 1 female) were selected whose illness was characterized by the standard criteria already adopted in the previous studies by these workers.

After preliminary and thorough investigations each received 15 gm. of thymine daily in two doses of 7·5 gm. each. They were detained in hospital until they had recovered and their blood values had approached normal.

A definite haematological response ensued. Reticulocytosis commenced on the 4th or 5th day of therapy, reached its peak on the 8th or 9th, and was followed by a rise in the erythrocytes and haemoglobin. This was confirmed by sternal puncture, which showed almost complete obliteration of the megaloblastic arrest.

Clinical improvement coincided with the advent of reticulocytosis.

Each of the patients gained weight and was free from symptoms at the time of discharge.

During the year which has elapsed, the blood values have been maintained at normal levels and the patients have had no recurrence of diarrhoea or other alimentary symptoms. *P. Manson-Bahr*

HAEMATOLOGY

McCord, W. M., Kelley, W. H., Switzer, P. K. & Culp, F. B. **Viscosity Studies of Erythrocytes from Persons with Sickle Cell Disease.** *Proc. Soc. Exper. Biol. & Med.* 1948, Oct., v. 69, No. 1, 19–22, 1 fig.

" A viscosimetric method is described for the study of the sickling tendency of red cells from subjects with sickle cell disease. This method does not differentiate between sickle cell anemia and sickle cell trait. Data are compared with observations of other investigators."

Thompson, R. K., Wagner, J. A. & MacLeod, C. M. **Sickle Cell Disease : Report of a Case with Cerebral Manifestations in the Absence of Anemia.** *Ann. Intern. Med.* 1948, Nov., v. 29, No. 5, 921–8, 2 figs. [31 refs.]

Jones, H. L., Jr., Wetzel, F. E. & Black, B. K. **Sickle Cell Anemia with Striking Electrocardiographic Abnormalities and other Unusual Features, with Autopsy.** *Ann. Intern. Med.* 1948, Nov., v. 29, No. 5, 928–35, 1 fig. [17 refs.]

VENOMS AND ANTIVENENES

Sergent, Et. Sérothérapie antiscorpionique. (Onzième note.) Observations médicales reçues pendant l'année 1947. [**Treatment of Scorpion Sting with Antivenin. Report for 1947.**] *Arch. Inst. Pasteur d'Algérie.* 1948, Sept., v. 26, No. 3, 256–8.

During 1947 the Pasteur Institute, Algeria, has received reports of 968 persons stung by scorpions ; in 348 of these the symptoms were said to be " alarming and giving cause to expect a fatal issue " ; in 25 others they were " serious but not alarming " and in 595 they were mild. In 40 instances only was the scorpion identified : 34 were *Prionurus australis*, four *Scorpio maurus*, and two *Buthus occitanus*. Special attention is drawn to patients with unusual symptoms or course.

(1) Three (one adult and two infants) already comatose, who recovered after injection of the antivenin ; in one case the symptoms subsided in so short a time as half an hour. These three bring the total of such cases [in the past 12 years ?] to 151.

(2) One patient gravely ill after a sting on the head. The total of such is now 37, of which 31 were severe.

(3) Sensation of cold, like ice, over the whole body, in place of the usual sensation of burning at the site of the injury. One patient's temperature was down to 34°C.

(4) Five cases of acute oedema of the lungs, four children, one adult. The last disappeared and could not be followed up ; one child died and it is noted that the serum was given in too small a dose and not until 3½ hours after the injury was inflicted. The other three recovered.

(5) Two—an adult and a child of 12 years—with multiple stings, three times by the same scorpion. The former was stung three times on the calf and his condition was serious but he recovered. The latter was stung on the back and did not receive treament until 24 hours later ; the child died.

Stings in Northern Africa are commonly by *Prionurus australis* ; those by *Buthus occitanus* are rare. Hence, the account of a European, 27 years of age, stung on the right thigh by one of them sent to the Institute is interesting. When seen an hour later, the patient was sweating and complained of sensations of alternating heat and cold, and of sialorrhoea. Ten cc. of the antiserum were injected subcutaneously ; 30 minutes later the symptoms were worse, with attacks of apnoea but without cyanosis, and a fatal issue was expected. Two hours after the stinging a second injection was given which brought about improvement. An hour later another 10 cc. were injected and in 7 hours recovery was complete.

The author states that this is the sixth recorded case of stinging by *Buthus occitanus* ; two did not receive the antivenin and died. [The others presumably recovered ; the author remarks that in Europe no fatal case of stinging by this species is recorded.]

He stresses once again the precautions to be observed in the treatment of these accidents : That injection of the antivenin should be given as soon as possible ; the first dose of 20 cc. (2 ampoules) regardless of the age of the patient. If there is no improvement in an hour this should be repeated and even if recovery seems to be complete the patient should be under careful observation for several hours, as symptoms may return and call for more injections. Even if the interval between the infliction of the injury and obtaining the antiserum is a long one—up to 24 hours—recovery is still possible.

Summing up the results : Of the 348 cases regarded as severe 331 were cured (95·1 per cent.) during 1947. Throughout the 12 years during which the serum prepared at the Institute has been used, 4,057 patients have received this treatment ; 1,003 were in an "alarming even desperate" condition, and of these 923 (92 per cent.) were cured. [For references to previous papers in this series, see this *Bulletin*, 1948, v. 45, 463.] *H. Harold Scott*

DERMATOLOGY AND FUNGUS DISEASES

REDAELLI, Piero & CIFERRI, Raffaele. Le granulomatosi fungine dell'uomo nelle regioni tropicali e subtropicali. [**Fungal Granulomata of Man in the Tropics and Subtropics.**] *Trattato di Micopatologia Umana.* Florence. 1942. Vol. 5, pp. xiv+698, 2 maps & 195 figs. (5 coloured). [50*s*.]

Although this book was published seven years ago, it contains an immense amount of factual information regarding medical mycology : it is inevitable that the rapid advance made during the war years should not be included, but the work covers a great deal of ground in respect of the material available at the time. In the General Section of the book, the first chapter deals at some length with climatic considerations, with special reference to equatorial zones and the former Italian East Africa : it also discusses relative incidence of fungal granulomata.

The second chapter discusses the pathology and morbid anatomy of human mycoses in the tropics and sub-tropics. The third chapter deals with the systematic classification.

The Special Section contains 12 chapters dealing specifically with the individual conditions, *e.g.* actinomycosis, rhinosporidiosis, coccidioidosis, various

blastomycoses, histoplasmosis, sporotrichosis, maduromycosis, verrucous mycosis of the skin, and various miscellaneous mycoses.

Each condition is dealt with systematically and at length, with descriptions of geographical distribution, aetiology, pathology, clinical features, diagnosis and treatment. Morphology and cultural methods are discussed and there are good and liberal illustrations of the fungi and the pathological and clinical lesions produced by them.

Each section contains an adequate and often very lengthy bibliography covering a wide range of the literature from many countries.

There is a subject index of more than 20 pages and an authors' index of 14 pages, in which the widely international sources of the references are apparent.

This work should provide a great deal of information for medical mycologists, even without familiarity with the Italian language.

H. J. O'D. Burke-Gaffney

HOPKINS, J. G., HILLEGAS, A. B., LEDIN, R. B., REBELL, G. C. & CAMP, E. **Treatment of Hyperhidrosis and Symmetric Lividities of the Feet.** *Arch. Dermat. & Syph.* 1948, May, v. 57, No. 5, 850–54, 2 figs.

In the course of a study of dermatophytosis among infantry troops at Fort Benning, Georgia, the authors encountered numerous cases of severe inflammation of the feet which they attributed to hyperhidrosis. These cases were of two types :—(1) diffuse hyperhidrosis in which excessive sweating of the whole foot occurred. In this condition the skin was often macerated and there was frequently erythema and oedema of the toes with fissuring of the interdigital webs and sometimes non-suppurative cellulitis of the toes. (2) Symmetrical lividities. These occurred in many men with, and a few without, general hyperhidrosis. The lesions consisted of sharply bordered plaques of white soggy skin surrounded by narrow violet-red borders. The plaques often appeared slightly raised, and were sometimes extremely sensitive to touch. They occurred most frequently on the sole of the heel and the heads of the metatarsals, but also on the plantar and lateral surfaces of terminal phalanges, and anywhere where the shoe or a neighbouring toe exerted pressure.

In treatment the following preparations were found useful :—

(1) Foot baths containing 4 per cent. potassium alum seemed the most useful treatment for cases of diffuse hyperhidrosis with inflammation.

(2) A 4 per cent. solution of formaldehyde painted on the affected areas gave the most prompt relief in cases of symmetrical lividity.

(3) For dressing denuded areas resulting from hyperhidrosis tannic acid ointments seemed useful, especially 10 to 20 per cent. tannic acid in a carbowax base.

(4) Where prolonged treatment was required, powders were more practical and probably of greater benefit. A powder containing 25 per cent. exsiccated potassium alum and 75 per cent. talc appeared satisfactory, but the most permanent and decisive results were given by powders containing 5 per cent. para-formaldehyde in talc or bentonite.

H. T. H. Wilson

HILL, W. R., RUBENSTEIN, A. D. & KOVACS, J., Jr. **Dermatitis resulting from Contact with Moths** (*Genus Hylesia*). **Report of Cases.** *J Amer. Med. Ass.* 1948, Nov. 6, v. 138, No. 10, 737–40, 3 figs.

Moths of the genus *Hylesia* inhabit the tropical regions of America. During the daytime they are found on tree trunks, walls, or fences, while at night the females appear in large numbers at certain seasons and then migrate in swarms. The authors describe how the crew of an oil tanker were exposed to moths which

swarmed on to their ship while it lay off the coast of Venezuela. Of 45 men exposed to the moths, 31 developed dermatitis of a papulo-vesicular or urticarial type. The eruption occurred not only as a result of exposure to moths but also after contact with moth-stained bed sheets The diagnosis was confirmed by positive reactions to patch tests with moth hairs. *H. T. H. Wilson*

CLARK, M. **Lymphostatic Verrucosis in the Fort Hall District of Kenya.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 287–90, 4 figs. on 2 pls.

In the last 3 years the author of this article has seen 200 cases of the condition described in Uganda by LOWENTHAL [this *Bulletin*, 1935, v. 32, 182] as lymphostatic verrucosis. The patients were Africans who lived round the foot of Mount Kenya and Aberdare Mountain Range. The condition was recognized clinically by the following features: (1) oedema of the leg extending up to, but never above the knee; (2) a barnacle-like growth of the foot; (3) ulceration, usually starting at the toes, and sometimes becoming severe enough to necessitate amputation.

Although generally bilateral, the condition, even when far advanced, was not infrequently limited to one leg. The hands and other parts of the body were never involved.

Attempts to isolate a causal organism by inoculation to media and inoculation into rabbits were unsuccessful.

Although lymphostatic verrucosis is frequently confused with mossy foot, there are several fundamental differences between the two conditions. Mossy foot starts with a vesicular stage, is painful, and bleeds easily on slight injury, it attacks parts of the body other than the leg, and can be transmitted to rabbits.

The author was unable to find any evidence of filarial elephantiasis, which is an unknown disease in the Fort Hall district, or of yaws in any patient suffering from lymphostatic verrucosis.

Routine treatment consisted of scraping away the growth with a short amputation knife. Bleeding was slight after this procedure, the growth did not tend to recur, and permanent benefit resulted. *H. T. H. Wilson*

ALEIXO, J. & FURTADO, T. A. Micose de Lutz de início possívelmente dentário. (Relato de cinco casos.) [**Mycosis of Lutz possibly of Dental Origin. Report of Five Cases.**] *Brasil-Medico.* 1948, July, 17, 24 & 31, v. 62, Nos. 29, 30 & 31, 265–8, 6 figs. English summary (9 lines).

The epidemiology of South American Blastomycosis (Lutz's disease) is rather obscure. Lacaz cultivated the causative fungus, *Paracoccidioides brasiliensis*, on various vegetable materials, including mushrooms, and the almost constant occurrence of early lesions of the disease about the buccal, lingual and pharyngeal mucosae and the tonsils lends credence to the view that infection is caused by chewing vegetable matter on which the fungus has been growing saprophytically. LACAZ and DE OLIVEIRA [this *Bulletin*, 1949, v. 46, 84] have recently described a few cases in which the initial lesions occurred in the anal region and were attributed to the use of raw vegetable matter in attending to the toilet of the anus.

BOGLIOLO [this *Bulletin*, 1947, v. 44, 349] described a granuloma of a tooth socket which was caused by *P. brasiliensis*, and the present authors have added five new observations suggesting infection in connexion with the teeth. In all five cases there was a history of severe dental disease, usually associated with pain, inflammatory swelling and ulceration, and all were treated by extensive extractions of the affected teeth, which were followed within a few months by active granulomatous ulceration which spread to the lips and neighbouring

parts and was followed by generalized disease. The diagnoses were based on microscopy or the cultivation of the causative fungus. Apparently, in the cases described, *P. brasiliensis* was not a mere invader of the traumatized gum and alveolar tissues, but it was the cause of the initial dental disease.

J. T. Duncan

NINO, F. L. Granuloma paracoccidioidico. (Forma linfático-tegumentaria curada con sulfadiazina.) [**Paracoccidioidal Granuloma.**] *Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1948, Apr.–May–June, v. 24, No. 184, 114–27, 15 figs. English summary (9 lines).

Report of a case in Buenos Aires cured by sulphonamides.

KRAPIN, D. & LOVELOCK, F. J. **Recurrence of Coccidioidal Cavities following Lobectomy for a Bleeding Focus.** *Amer. Rev. Tuberculosis.* 1948, Sept., v. 58, No. 3, 282–90, 3 figs. [12 refs.]

" 1. A brief discussion of the recognized indications for lobectomy and the inherent dangers in pulmonary coccidioidomycosis is presented.

" 2. A case is reported in which persistent hemoptysis from a coccidioidal cavity proved severe enough to warrant surgical resection of the involved lobe.

" 3. After a period of one year, the case was complicated by the appearance of coccidioidal cavities in the remaining lobe of the previously operated lung."

POTENZA, L. & CELIS PÉREZ, A. Rhinosporidiosis nasal humana. Primera observación venezolana. [**Nasal Rhinosporidiosis in Man. The First Venezuelan Case.**] *Rev. Policlinica Caracas.* 1947, July–Oct., v. 16, Nos. 95/96, 244–57, 9 figs. [31 refs.]

A man of 55 years, a bricklayer (albañil) by trade, consulted the authors on account of " difficulty in breathing, fetid discharge from the nose, loss of the sense of smell and repeated epistaxis " for some months. Kahn test gave a 3-plus and the patient was given Bivatol. After a time [perhaps 2 months, but the paucity of dates makes this uncertain] the Bivatol was changed for Thiomercan and eight weeks later the local condition was much improved, but in the right nostril a pedunculated papilloma was visible and, on the left side a verrucose condition. After another 8 weeks the lesions appeared unchanged and the tumour was removed under local anaesthesia ; the septum was seen to be perforated. During the ensuing 5 months there was no increase in the size of the perforation and the patient seemed to have been cured. Histological examination of the tumour showed it to be *Rhinosporidium seeberi*, as is clearly depicted in a series of photomicrographs.

In a review of the literature of this condition in S. America since 1892, when MALBRAN reported a case in man in Argentina, the authors have found only 22 cases : 9 human cases in Argentina ; 7 in Uruguay (2 human, 4 in horses, and 1 in an ox) ; 3 in Paraguay, 2 in Brazil and the present one in Venezuela—the first to be recorded there—all in man.

H. Harold Scott

HEAT STROKE AND ALLIED CONDITIONS

FOURMAN, L. P. R. **Effect of Climate on the Blood Pressure in Acclimatized Subjects.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 299–301.

" In sailing from the Red Sea to the Mediterranean, there is a sudden fall in temperature and humidity. Observations were made on the effect of this change

in climate on the blood pressure. Forty-five subjects of varying ages and three patients with hypertension were studied under resting conditions. There was no significant change in the blood pressure when the relative humidity diminished by about 20 per cent."

TROPICAL ULCER

RANSFORD, O. N. **Therapeutic Extradural Block in Tropical Ulcer.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, Nov., v. 42, No. 3, 267–75. [39 refs.]

This paper is based on a large number of cases of tropical ulcer seen in Nyasaland and East Africa, and the author regards the condition as an infection imposed on a localized area of skin ischaemia. As has been observed in the lower part of the front of the legs and ankles, the blood supply is through terminal blood vessels of adjoining arteries which do not overlap and are unusually well supplied with vasoconstrictor fibres. This area shows a high incidence of tropical ulcer. An essential predisposing cause is malnutrition.

Sympathectomy, periarterial stripping of the common femoral artery, lumbar sympathetic block and therapeutic spinal block are discussed. The author recommends extradural spinal block, the advantages being that a sensory and sympathetic segmental paralysis is obtained without motor paralysis and the fall in blood pressure is minimal. It can be reapeated at intervals of a few days without risk but should be reserved for cases unlikely to heal quickly with more conservative methods The technique follows that described by DAWKINS [*Proc. Roy. Soc. Med.*, 1945, v. 38, 299]. The patient lies on the affected side with a head-down tilt of 10°. A weal of local anaesthetic is raised between the 1st and 2nd lumbar vertebrae and a spinal needle of narrow bore is introduced as for ordinary lumbar puncture, but without the stilette. The needle is attached to an Odom's indicator which consists of a glass capillary tube, and which, when placed in sterile water, fills with the inclusion of a small bubble. When the needle reaches the epidural space (about 4 mm. in diameter) the negative pressure makes the bubble move a short distance towards the needle. The indicator is now removed and 25 cc. of nupercaine (1 : 1,500) introduced slowly. A skin thermometer is strapped to the leg before operation and left until a constant temperature is recorded. After a successful block, a rise of 4 to 8°F. is recorded.

Three cases are described in detail :—

(1) An African male, aged 11, with an ulcer 3 cm. in diameter over the left external malleolus. Skin temperature above the internal malleolus was 90·6°F. Fifteen minutes after injection the temperature was 94°F. The ulcer, which was dressed with saline compresses, was healing well after 4 days and the patient was discharged cured 3 days later.

(2) An African girl, aged 12, with an ulcer 7 cm. by 5 cm. on the front of the left leg. Smears showed fusiform bacilli and spirochaetes and the surrounding skin was unhealthy and broken down above the ulcer. Temperature over the dorsum of the foot was 89·8°F. Twenty-five minutes after puncture the temperature here was 97·2°F. and the condition of the ulcer improved greatly over the next 4 days. At the end of this time the base of the ulcer was clean, further healing being uneventful.

(3) An elderly male African had suffered from ulcers over the left leg for 3 years, the ulcers being adjacent and measuring 7·5 by 3 cm. and 5 by 2·5 cm. The temperature of the foot was 93°F. and only rose 0·2° half an hour after

extradural block. Healing within 7 days was nearly complete and the patient was discharged 11 days after block. [No mention is made of local treatment.]

Where skin anoxia is due to structural disease of the arteries sympathetic block cannot be regarded as being specific, as the lumen of the affected arteries is probably incapable of much increase. The sharp rise in skin temperature following sympathetic block suggests that the released vessels are in a state of vasospasm.

The aetiology of tropical ulcer is summarized as "Skin anoxia and infection": in difficult cases treatment should be given for both factors. *C. F. Shelton*

MISCELLANEOUS DISEASES

GALLIARD, H. Myiases humaines au Tonkin. [**Human Myiasis in Tonking.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 3/4, 230–33.

Fifteen cases of myiasis have been observed in the clinics of the Faculty of Medicine at Hanoi. Of these, larvae were found in the external auditory meatus on five occasions, once in a case of osteitis of the skull, seven times in wounds or ulcers of the legs or feet, once in an abscess of the hand, and once in an ulcer of the scalp. In the last case the larvae were those of *Sarcophaga fuscicauda*, and in all the rest *Chrysomyia bezziana*.

The case of *S. fuscicauda* infestation was that of a child of 12 months whose mother gave a history of furuncles of his scalp that opened spontaneously. Maggots were observed in the ulcers; these persisted despite treatment with some home remedy. When seen, the child had two large oval ulcers (4 to 5 cm. with jagged edges) in the parietal region and several smaller ulcers on the occiput. There was a foetid purulent discharge: later the ulcers joined and a large area of bone was laid bare. The child's temperature rose to 39·6°C. [103·2°F.] and remained in the region of 38·0°C. [100·4°F.] for nine days. The ulcers were filled with larvae of *S. fuscicauda* which were removed by means of forceps and an antiseptic lavage. At the time of discharge a week later the temperature was normal and the ulcer was improved but not of course healed.

The second case described was that of an Annamite infant who was admitted to hospital with necrosis of the angle of the jaw. The wound was gangrenous and full of larvae. This condition was effectively treated, but the child was brought back forty days after discharge from hospital with supra-clavicular adenitis. This improved on local treatment but the child returned a third time with a fluctuating and painful swelling of the gland which was eventually opened, four months and seven days after the child's first admission, and a dead but well-preserved third-stage larva of *C. bezziana* was recovered from the abscess.

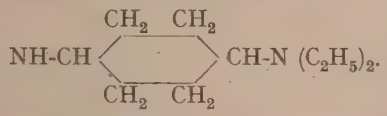
The larvae of *C. bezziana* are not recognized in Africa or in the Philippines as infecting man, but are only parasites of animals. *L. E. Napier*

PROTOZOOLOGY: GENERAL

ISHII, N. **Researches on the Chemotherapy of Protozoal Infections.** *Japanese Med. J.* 1948, Feb., v. 1, No. 1, 30–51.

This paper describes the results of tests carried out with a mixed series of compounds on various protozoal infections including human and bird malaria,

Trep. duttoni and *Trypanosoma gambiense* infections of mice, kala azar of man and the striped squirrel and *in vitro* tests on *E. histolytica* and *Trichomonas hominis*. The English is quaint and there are a number of errors in names and dates. No details are given of the tests, which appear to have been carried out on a very limited scale in man. Two substances, 1-sulphanilamido—3 : 5 dibromobenzene and its chloro analogue, not antagonized by *p*-aminobenzoic acid, "were applied for three tertian cases with desirable results". These substances, SN.187 and SN.2500 respectively, are described in the Survey of Antimalarial Drugs by WISELOGLE [this *Bulletin*, 1947, v. 44, 1106]. Some substituted dihydro-cinchonidines (or cinchonines) showed promise in human malaria and also "modified atebrin" [mepacrine] in which the original side chain of the German product was replaced by



The latter was easier to make than atebrin and proved equally active in canary malaria. "The malaricidal action in five tertian cases was demonstrated with satisfactory results". A natural product from an Asiatic plant—cepharanthin—a benzyltetrahydroisoquinoline described by KONDO & TOMITA (*Arch. Pharm.* 1936, v. 274, 65), was first used in the treatment of tuberculosis and is here described as a provocative for exoerythrocytic forms of plasmodia, through stimulation of endothelial cells whereby the exo-forms appear in the blood stream. In conjunction with standard antimalarial drugs it was reported to eradicate tertian [benign or malignant ?] malaria infections. Two other related substances are stated to possess similar properties. A number of sulphonamides were found to be active against *Trep. duttoni* infections of mice. Several oxyquinoline sodium antimony compounds (constitution not stated) showed activity against *T. gambiense* in mice and *in vitro* against *E. histolytica* and *Trichomonas hominis*. Activity is claimed for 4 : 4′ diguanidinodiphenylsulphoxide in the trypanosome infection and in human kala azar. Other compounds found to be active against *E. histolytica* were SN.187 mentioned above and also 3-carboxy-4-aminoazobenzene-4′-sulphonamide.

J. D. Fulton

ENTOMOLOGY AND INSECTICIDES : GENERAL

NATVIG, L. R. **Contributions to the Knowledge of the Danish and Fennoscandian Mosquitoes. Culicini.** *Norsk Entomologisk Tidsskrift.* Oslo. 1948, Suppl. I. pp.xxii+567, 148 text figs., 12 pls. & 1 folding map.

The present book is a full-length monograph by a man who has evidently worked on the subject for a number of years and has given careful attention to all available sources of information. He is interested primarily in the thirty-five species of Culicine mosquitoes which occur in Denmark, Norway, Sweden and Finland. For these countries he gives detailed local records ; outside that area he provides information of a more general sort relating to the same species. A considerable proportion of the mosquitoes of these northern countries have a very wide Arctic distribution in the Old World ; several of them occur also in Northern America.

Fifty-five pages are given to an account of the external anatomy of Culicine mosquitoes. The treatment is full with a number of figures, a list of technical

terms and alternative terms used by other authors. Though the section is valuable one may perhaps ask whether a general account of this nature could not be produced once and for all. It seems hardly necessary that all this information should be repeated as it tends to be in monographs dealing with mosquitoes of different parts of the world.

After giving a briefer account of internal anatomy, the author passes to general notes on the biology of northern Culicines. He deals with the type of water in which the different species breed and the association of one species with another. In discussing the feeding habits of adults he quotes the work of others who have shown that not only the males but the females of some Culicines may feed upon nectar in nature. He reaches the conclusion that females of all or nearly all these northern Culicines are bloodsuckers, but does not go into the question whether the individual female can lay a small number of eggs if she is unable to obtain a meal of blood.

The transmission of disease by mosquitoes in Northern Europe is relatively unimportant. One should, however, remember that tularaemia is widespread and it appears from the work of Olin that without doubt the infection is occasionally transmitted by mosquito bites. Encephalitis infections (the St. Louis type and the equine) are not known from this area. Fowl pox occurs in Denmark and parasites of several " bird malarias " have been recorded from a number of species of birds in Sweden.

Much more important than the diseases is the mosquito plague, a general and very serious Arctic problem. The author has gathered together extracts from the works of many travellers and recounts his own experience. This part of the work is most useful for it calls attention to a matter of considerable importance : the number of blood-sucking mosquitoes is hardly to be believed : they cause extreme discomfort by day and by night and may drive man or animals to frenzy : casualties occur owing to swollen hands and faces, fever and lack of sleep. The biological explanation of the immense numbers of mosquitoes is due to the work of the freshwater biologist Thienemann, who pointed out that when the ground is frozen it is impossible for water to percolate downwards. When the surface of the ground thaws in the spring and early summer the water must lie on the top or run over the top, and it may become very warm during the long day of the Arctic summer. For a brief season it gives rise to enormous numbers of adult Culicines, mainly species of *Aëdes*. As to the source from which all these mosquitoes would normally obtain blood, we are insufficiently informed. The present author does not accept the view of Thienemann that the insects feed mainly on small rodents (voles and lemmings). He regards reindeer, both wild and domestic, as a most important source of blood for the mosquitoes, but we feel that he hardly gives sufficient attention to the fact that there are many areas in the Arctic with abundant mosquitoes but no reindeer. As to birds, he can only provide a scanty number of records of mosquitoes feeding upon nestlings. The whole question appears to be one urgently requiring study. It is at least possible that in some of these species the female, though willing enough to take blood, can lay a small number of eggs without having fed on blood.

The greater part of the book deals with taxonomy, reviewing classification and nomenclature and the literature of Scandinavian mosquitoes. The author gives some interesting notes on variability and on structural abnormalities, and calls attention to the fact that in the mosquitoes there are a number of pairs of very similar so-called " sibling " species. The systematic review covers the thirty-five species of Culicines known to occur in this area. The few Anopheline mosquitoes are not dealt with : one may hope that they will before long be monographed in a similar manner. After reviewing the species in a very thorough manner the author discussed the composition of the fauna, its relation

to geography and so forth. Here we find lists of the mosquito species which are known to occur in each of the countries under discussion together with their distribution outside Scandinavia. One list shows the species of this area and indicates which of them occur also in Siberia or in North America.

The monograph contains 148 figures, many of them dealing with points in the anatomy of larvae and adults. Some deal with breeding places and other biological matters and there are maps of the distribution of many of the species, and on matters of general zoogeographical interest. The paper contains a number of taxonomic keys. The general presentation is excellent. The English is always clear. There is an unusually full list of references and an index.

P. A. Buxton

SENEVET, G. A propos de *Anopheles (Nyssorhynchus) ininii* Senevet et Abonnenc, 1938. [*Anopheles (Nyssorhynchus) ininii* **Senevet and Abonnenc, 1938.**] *Arch. Inst. Pasteur d'Algérie.* 1948, Sept., v. 26, No. 3, 277–9, 1 fig.

SENEVET, G. *Anopheles pessoai* en Guyane française. Description de la nymphe. [*Anopheles pessoai* **in French Guiana. Description of the Nymph.**] *Arch. Inst. Pasteur d'Algérie.* 1948, Sept., v. 26, No. 3, 280–87, 2 figs.

RACHOU, R. G. Encontro da *Chagasia rozeboomi* Causey, Deane e Deane, 1944, no estado de São Paulo. [**Presence of** *Chagasia rozeboomi* **in São Paulo.**] Reprinted from *Malariologia e Doenças Tropicais.* Rio de Janeiro. 1948, July–Sept., v. 1, No. 1, p. 13.

The English summary appended to the paper is as follows :—

"In this article, the Author refers to a new species, *Chagasia rozeboomi* Causey, Deane & Deane, 1944, found in State of São Paulo, Brazil."

SYMES, C. B. **Commonwealth Air-Route Sanitation : a Suggestion.** *J. Roy. San. Inst.* 1948, Sept., v. 68, No. 5, 539–44. [12 refs.]

It has been established beyond doubt that many insects which are potential carriers of disease can be transported by aircraft, without detriment to themselves, to places where they could do great damage, as for instance by the dissemination of yellow fever. The organizations concerned in the reduction of this risk are badly co-ordinated, too numerous, and often have too parochial an outlook. The author recommends the creation of a high level authority of "air sanitation", consisting of a committee and a powerful executive staff, with powers wide enough to ensure that disease vectors would not be carried on to aircraft, rather than as at present to prevent them being brought off them. This would involve supervision of the sanitation of airfields in endemic zones, and of the urban areas from which passengers come. In addition sanitary zones should be created, co-terminous with the endemic areas of important diseases, and a double protective ring of "sanitated" airports created within the zone and outside it, so that the ports of embarkation and potential disembarkation of disease vectors are protected not by quarantine but by sanitation. Further work should also be carried out on the disinsectization of aircraft by residual insecticides.

G. Macdonald

CALIFORNIA MOSQUITO CONTROL ASSOCIATION. **Proceedings and Papers of the Sixteenth Annual Conference of the California Mosquito Control Association held at Agriculture Hall, University of California, Berkeley, California, February 12, 13, 14, 1948.** [Edited by H. F. GRAY & R. F. PETERS.] 89 pp., 4 figs. & 5 charts. 1948. Berkeley I, California: Post Office Box 649.

In California there are forty-one mosquito abatement districts covering some 16,000 square miles, and others are in process of organization. On this work the above Association spends about $2,000,000 annually and it is likely that this sum will be exceeded in the coming year. At this three-day meeting of the Association, papers were read by many authors and they are reported *verbatim* in this volume which also includes reports on the progress of mosquito control work in other parts of the U.S.A. A wide range of subjects is covered, including some of local interest only and dealing with such matters as organization, administration, finance, legal matter and some of a technical nature. A short account is given of the inauguration in 1947 of a State Bureau of Vector Control which comes under the Department of Public Health. In this the author describes the scope and proposed activities of this Bureau and its relationship to local mosquito abatement organizations. A first list of vector-borne diseases to receive immediate attention by the Bureau includes encephalitis, fly-borne diseases, malaria, plague, "Q" fever, relapsing fever, Rocky Mountain spotted fever, tularaemia and typhus fever.

Other papers are of more general interest and the fact that most of them are the results of practical experience in the control of mosquitoes and other arthropods adds to their value. Members plead for better diagnosis of malaria and improved methods of keeping records. The flight range of *Culex tarsalis* was discussed, methods of dealing with noxious arthropods other than mosquitoes were described, and the importance of the selection of insecticides for particular purposes was stressed. The necessity for continuing the search for new insecticides was also emphasized in view of the toxicities and tolerances of DDT and other substances, indicated by the contamination of pasturage, the effect on agricultural pests, the danger to fish and the DDT tolerance by certain flies. Other papers describe the application of insecticidal fogs from a machine mounted on a jeep, an aerosol generator, amphibian vehicles, aeroplane spraying and the keeping of mosquito cultures in the insectary.

The importance of maintaining good public relations is pointed out, even to the extent of doing extra work not strictly coming under the heading of mosquito control, and by propaganda in newspapers, films and radio.

It is inevitable in a report of this kind that there should be some overlapping and repetition, but each author approaches his subject from his own angle and a wide view is thus given of the activities of this association. The conference appears to have been held in an atmosphere of friendly enthusiasm.

H. S. Leeson

VANNOTE, R. L. **Adult Mosquito Control a Useful Emergency Tool.** *Mosquito News.* 1948, Mar., v. 8, No. 1, 9–13, 3 figs.

The author is concerned with the protection of large highly-developed residential areas from mosquito nuisance, circumstances in which the prevention of breeding by permanent means is the most desirable method, other methods being brought into use to combat breakdowns in the normal programme. The best auxiliary methods are then those that produce immediate results.

Pyrethrum sprays applied to ground areas were a great advance. With the arrival of DDT the policy has been to treat the country across which mosquitoes

fly in large numbers by the application of DDT solution from aircraft, and to exterminate those that have reached residential areas by means of smoke from machines such as the Todd Insecticidal Fog Applicator. *G. Macdonald*

DICKINSON, W. H., MERRITT, D. & HOUGH, J. **Observations on a Tifa used by the Consolidated Mosquito Abatement District.** *Mosquito News.* 1948, Mar., v. 8, No. 1, 14–16.

The authors' interest is to destroy nuisance mosquitoes, such as *Aëdes* species, the breeding of which cannot be controlled, though it may be very extensive as on irrigated land. The Todd Insecticidal Fog Applicator was found to give very satisfactory results. The fog, allowed to drift over agricultural land where such breeding occurred, killed all adult mosquitoes through a strip a mile long, as laid by the machine on a truck, to a depth of one and a quarter miles. The average amount of DDT used was 0·04807 lb. per acre thus treated, and the average cost for labour and material 11·5 cents per acre. *G. Macdonald*

MACCHIAVELLO, A. Siphonaptera de la costa sur-occidental de América. (Primera lista y distribución zoo-geográfica.) [**Siphonaptera of the South-West Coast of America (First List and Geographical Distribution).**] *Bol. Oficina Sanitaria Panamericana.* 1948, May, v. 27, No. 5, 412–60. [21 refs.]

Over the past fifteen years the author and his colleagues have examined 500,000 fleas during their work in Chile, Peru and Ecuador. From this work and from the literature, the author has been able to compile lists, which are given in full, of seventy-six species of fleas belonging to thirty-seven genera, and of ninety-six hosts, together with locality records which give their distribution in this part of South America. *H. S. Leeson*

LORD, K. A. **The Sorption of DDT and its Analogues by Chitin.** *Biochem. J.* 1948, v. 43, No. 1, 72–8.

RICHARDS and CUTKOMP (*Biol. Bull. Woods Hole*, 1946, v. 90, 97), have pointed out that there is a general correlation between the possession of a chitinous cuticle and sensitivity to DDT poisoning and also that chitin will "sorb" DDT out of a colloidal suspension. The author has made quantitative experiments which confirm this. Neither sand, cellulose nor asbestos appreciably sorbs DDT and though there is some indication of sorption with sheep's wool, it is very slight compared with chitin. These facts show that the sorption is not due to mechanical retention of DDT and also, since the cellulose molecule is very similar to that of chitin, that the action is physico-chemical or chemical and rather specific. Grinding of the chitin, which increased its surface area, also increased the amount of sorption, which is therefore a surface phenomenon. It was noted that sorption occurred rapidly at first and then apparently approached saturation. Tests with five DDT analogues (mainly corresponding halogen compounds) showed no significant evidence of correlation between toxicity and degree of sorption. *J. R. Busvine*

DE OLIVEIRA, S. J. & MOUSSATCHÉ, I. Açâo do DDT (Diclorodifenil-tricloretana) sôbre larvas e pupas de *Musca domestica* Linneu. [**The Action of DDT on Larvae and Pupae of *M. domestica*.**] *Rev. Brasileira Biol.* Rio de Janeiro. 1947, Mar., v. 7, No. 1, 67–72, 4 figs. [Summary taken from *Rev. Applied Entom.* Ser. B. 1948, Oct., v. 36, Pt. 10, 157–8.]

In each of the tests described, which were carried out in Rio de Janeiro in 1946 a trough was filled with fresh horse manure and left for four days, after

which time larvae of *Musca domestica*, L. in all instars were present. The manure, which was about 18 ins. deep, was then sprayed with suspensions of a preparation containing 10 per cent. DDT (Neocid M), diluted to give 1 : 2,000, 1 : 1,000 or 1 : 500 parts DDT in water, at a rate of about 13 pints per sq. yard. The manure was left uncovered after treatment, except on one occasion when rain threatened, and 3–6 days later 600–1,300 puparia collected from it were placed in groups of 100 in tubes containing a little damp earth, and the flies that emerged were counted. The results showed that the percentages of normal, semi-normal and abnormal adults and of puparia from which no emergence occurred were 25·46, 7·23, 12·23 and 55·07 for DDT at 1 : 2,000 ; 1·1, 0·2, 3 and 95·7 for DDT at 1 : 1,000 ; and 11·16, 0·16, 1·66 and 87 in one series and 22·5, 16·8, 15 and 45·7 in another for DDT at 1 : 500. Many of the pupae from which no emergence occurred were abnormal in appearance, and dead larvae in all instars were numerous in the treated manure in the trough.

DE MEILLON, B., THORP, J. M. & HARDY, F. **An Apparatus for the Rapid Screening of Drugs for possible use in Chemotherapeutic Control of Ecto-parasites and some Results obtained with it.** *South African J. Med. Sci.* 1948, June, v. 13, No. 3, 115–19, 1 fig. [14 refs.]

The apparatus consists of a metal slide with a circular depression (about one inch in diameter) which holds about one ml. of blood. Blood is withdrawn from an animal and defibrinated, by stirring, before it is added to the cavity. One advantage of the small quantity of blood is that there is little tendency for cells and serum to separate, which is important, since either serum or cells alone are toxic for some blood-sucking insects (*e.g.* bed bugs). The metal slide is kept at blood heat on a warm stage and the feeding tube, closed with a membrane, is placed on it so that it just fits into the blood-filled cavity (and displaces a little blood round the rim, which dries and forms a seal).

The feeding tube and membrane are made as follows. A mouse is killed and the whole body is treated with a depilatory (50 per cent. barium sulphide, 50 per cent. chalk). After thorough washing, the skin is removed and washed in running water for an hour or so, dried on blotting paper and stretched over the mouth of the tube, where it is fixed by a rubber band. After use, the skin is washed in water, *in situ*, dried and stored in a cupboard. It can be used again up to a week after preparation. The feeding tube should not be more than two inches long.

For testing possible insecticidal compounds, the samples are added to the blood and ground with it in an agate mortar. Or they can be added in aqueous solution provided that not more than 10 per cent. water is added to the blood.

The compounds tested by the authors follow the work of KNIPLING *et al.* [this *Bulletin*, 1948, v. 45, 815], who showed that the indandione series were promising as chemotherapeutic agents against bloodsucking arthropods. This fact is confirmed. Particularly promising also, were substances related to vitamin K, *i.e.* anti-haemorrhagic agents, the calcium and sodium salts of 2-methyl-1, 4-naphthahydroquinone diphosphate (" Synkavit ").

J. R. Busvine

WILSON, S. G. **A Method of assessing the Acaricidal Properties of DDT and " Gammexane " Preparations in Field Trials.** *Bull. Entom. Res.* 1948, Aug., v. 39, Pt. 2, 269–76, 5 figs.

Cattle in the neighbourhood of Entebbe, Uganda, are liable to be infested with a variety of tick species which characteristically attach at different parts of the body. Some preliminary indications of the chosen foci of several ticks

are given in a sketch. For the purpose of insecticidal tests, it would be difficult to make complete counts ; therefore results were judged on the counts of *Rhipicephalus appendiculatus* attached on the ears and *Amblyomma variegatum* on the udder and flanks of cattle.

For control purposes, DDT and *gamma* BHC have many advantages over arsenic. Some trials of these preparations were made with a DDT emulsion and a *gamma* BHC aqueous suspension (prepared from the dispersible powder P530). Preliminary field trials showed that both 2·5 per cent. DDT or 0·325 to 0·65 *gamma* BHC gave a fairly good kill of the ticks, but very little protective action beyond four days. The addition of coumarone resin to the DDT emulsion did not improve its residual action. At the suggested rates, it would be necessary to treat cattle weekly to obtain control.

Treatment was easily achieved by spraying the cattle's ears with a " Kent " type sprayer, while they walked through a bath of insecticide which treated the udder and flanks. *J. R. Busvine*

LAWS, S. G. **A Biological Test for assessing the Acaricidal Properties of DDT and " Gammexane " Preparations.** *Bull. Entom. Res.* 1948, Aug., v. 39, Pt. 2, 277–9, 1 fig.

For each test an open-ended tube, 10 cm. long by 2 cm. in diameter is used. It is lined with a small roll of filter paper which is moistened with 0·5 ml. of the insecticide liquid under test. The ends of the tube are sealed by caps formed of filter paper moistened with the insecticide in the same way and bound in position with gummed paper while still moist.

The ticks (either laboratory bred or freshly collected) are placed on a square of filter paper and swabbed with the test solution. About 10 are used for each test. They are then placed in the prepared tube by removing and then replacing one of the paper caps. The tube is left horizontal and the filter paper caps, etc., dry in 3–6 hours. Mortalities of ticks are determined after 6, 24, 48 and 72 hours.

It is claimed that the method reproduces the conditions of practical dipping of infested animals, in which the ticks experience initial soaking in insecticide, followed by exposure to a moist surface which gradually dries.

J. R. Busvine

PLACKETT, R. L. & HEWLETT, P. S. **Statistical Aspects of the Independent Joint Action of Poisons, particularly Insecticides. I. The Toxicity of a Mixture of Poisons.** *Ann. Applied Biol.* 1948, Sept., v. 35, No. 3, 347–58, 5 figs. [14 refs.]

RAMALHO, A. C. R. & RABELLO, E. X. Sôbre uma nova fórmula de corante para material entomológico. [**A New Staining Formula for Entomological Material.**] *Gaz. Clínica.* S. Paulo. 1947, Nov.–Dec., v. 45, Nos. 11/12, 169–70.

The authors give the formula of a stain which they have found to be suitable and constant for small insects or for minute parts of small insects such as genitalia, mouthparts, etc., for microscopical examination. It is made up of one gramme of fuchsin and 1 gramme of eosin dissolved in 100 cc. of 80 per cent. alcohol to which is added 100 cc. of 10 per cent. acetic acid. The mixture must be filtered before use.

After the insect or part has been softened and cleared in warm 10 per cent. caustic potash, it is put straight into the stain and gently warmed for a minute or so. The rest of the procedure is as usual through creosote to Canada balsam for mounting. *H. S. Leeson*

BOOK REVIEWS

GRADWOHL, R. B. H. [M.D., D.Sc., F.R.S.T.M. & H. (London), etc.]. **Clinical Laboratory Methods and Diagnosis. A Textbook on Laboratory Procedures with their Interpretation. Vol. I.** 4th Edition. pp. xiii+1296, 41 coloured pls., 362 text figs., 4 charts & 5 graphs. 1948. St. Louis: The C. V. Mosby Company. [3 vols. $40.]

This, the fourth edition of a book which has been generally acknowledged as a standard work has proved to be a stupendous undertaking. From comparatively modest beginnings in 1935 it has blossomed out into three bulky volumes of which the first two are devoted to laboratory procedures and the third to parasitology. Of the three before us this first undoubtedly contains the most indispensable information and is also the most bulky. It is almost impossible within the space of a review to give an adequate idea of the mass of detail which this book contains, most of which is essential to the modern laboratory worker. There are nine chapters: the first is devoted to general considerations, such as the microscope, photomicrography, the analytical balance, metric weights and measures, general facts on solutions and an explanation of the hydrogen ion concentrations. Chapter II deals mainly with urine analysis. Among other methods are general directions for collecting specimens, detection of sugar, albumin and proteoses, determination of drugs in urine, microscopic examination, special urine chemistry, cystoscopic urinalysis and estimation of kidney functions.

As the author announces in the preface, one of the fundamental subjects is modern haematology so that the next three chapters, III to V, are occupied with the most complete and up-to-date account of this important speciality grouped under the headings of blood chemistry, haematology, blood grouping and transfusion. This is undoubtedly the high-water mark of the book and the treatment of this huge subject is almost without a rival. Here we find directions for methods of procuring and handling blood for chemical examination, clinical colorimetry, the technique of blood chemistry, blood sugar estimation, glucose tolerance test, total non-protein nitrogen, interpretation of blood changes in nephritis, liver function tests, cholesterol, calcium, inorganic phosphorus, acidosis, blood ketones, sulphonamide drugs and estimation of blood thiocyanates. Haematology proper deals with the origin of blood cells, the physiology of haematopoietic organs, normal composition of the blood, description of stained cells, bone marrow studies, special staining methods, tests for coagulation of blood, relationship of the liver to blood disorders and diseases of the reticulo-endothelial system, blood picture in various infectious diseases and haematology of infants and children.

Blood groups and transfusions demand a knowledge of the technique of blood grouping, agglutinogen Rh in human blood, whole blood transfusion and prevention of haemolytic reactions, blood plasma, bone marrow infusions, protein metabolism and parenteral protein hydrolysate, blood groups and heredity.

Chapter VI deals exhaustively with gastric analysis, test meal examination, microscopic examination and the conclusions to be drawn and similarly the technique of estimation of duodenal contents.

Chapter VII is devoted to the examination of puncture fluids, cellular structure of effusions, aspiration biopsies and cerebrospinal fluid.

In Chapter VIII the faeces are given general consideration and the account follows accepted lines.

In Chapter IX special tests are described in various directions, such as determination of cystine in fingernails, laboratory tests for pregnancy, vaginal

smears, suction curettage, hypersensitiveness, protein sensitization, mycological diagnosis, semen appraisal, deficiency diseases and special tests in connexion with examination of food contamination.

The whole book appears to be meticulously compiled and the descriptions are particularly clear and accurate. A feature which will commend itself is the full documentation in the form of footnotes.

The volume is printed on art paper, the type is clear and all the figures, photographic and otherwise, are beautifully reproduced and this especially applies to the coloured plates of blood pictures and bone marrow smears. Laboratory workers the world over will be grateful to Dr. Gradwohl in having completed such an outstanding compilation. *P. Manson-Bahr*

GRADWOHL, R. B. H. [M.D., D.Sc., F.R.S.T.M. & H. (London), etc.]. **Clinical Laboratory Methods and Diagnosis. A Textbook on Laboratory Procedures with their Interpretation. Vol. II.** 4th Edition. pp. 1297–2284 – 127 pp. of Index to Vols. I & II, 328 text figs. & 10 coloured pls. 1948. St. Louis: The C. V. Mosby Company. [3 vols. $40.]

This is the second volume of the fourth edition of what has become a much valued book of reference on a large variety of technical procedures, though throughout it has managed to preserve its human values without degenerating, as it might so easily have done, into a mere encyclopaedia. The main topics are grouped under the headings of Bacteriologic Application to Clinical Diagnoses, Serology, Postmortem Examinations, Tissue Cutting and Staining, Preparation of Museum Specimens, Toxicological Technique, Detection of Crime by Laboratory Methods, Basal Metabolism, Electrocardiography, Museum Supplies, Equipment and Reagents for Pathological Laboratories. This surely constitutes a motley heterogeneous collection, but the reader must not imagine, because it is so, that each section does not provide an up-to-date authoritative account of each subject, so that the book has become an indispensable adjunct of every pathological and clinical laboratory.

We can point out, for instance, the value of a list of certified stains prepared by the Biological Stain Commission and this includes the methods of application. A very useful plate (XLII) illustrates the tints produced by adding phenolsulphonephthalein (phenol red) to a series of phosphate solutions of H ion concentrations indicated in each case by *p*H.

Some 43 pages are devoted to the preparation of various specialized media and some 20 to culture methods. The classification and identification of pathogenic organisms are gone into at great length and in this respect the *Salmonella* group is given special preference in a manner hardly to be found elsewhere, and a table (XCVI) epitomizes the characteristics of no less than 113 members of this group. It is surprising to find that the dysentery bacilli in contrast receive so little attention. Those spirochaetes which are referred to under the generic title of *Borrelia* are dealt with more extensively in Vol. III, but the genera *Treponema* and *Leptospira* receive their due.

In the section on tuberculosis, the simplification of fluorescence microscopy as devised by Graham is given in detail. The bacteriology of milk, testing of disinfectants, the vexed question of bacteriophage in diagnosis and therapy are each considered in the light of modern knowledge and the reader will also find a fairly complete account of rickettsiases and virus diseases and the classification of the latter is compressed in table form (CXIX). Rabies also receives considerable space and a résumé is given of the Pasteur treatment of this fell disease. The section on serology occupies more than 100 pages, the greater part being taken up by various modifications of the Wassermann and Kahn tests.

It is possibly more detailed than in any other publication and also includes the technique for the complement fixation test for amoebiasis.

Chapter XII which describes postmortem examinations is well illustrated with elaborate and expensive apparatus such as is seldom available to pathologists in this country.

Chapter XIII on tissue cutting and staining follows on well-tried lines and describes the technique of frozen sections according to the method of Krajian, whilst great importance is paid to the selective cytology of Ayre for obtaining biopsy material from the cervix uteri. Toxicological methods and the detection of crime occupy a niche of their own and demand such specialized apparatus and technique as to be outside the scope of the ordinary medical reader. They include the sensational polygraph or "lie detector". In basal metabolism we find ourselves in a new world and these investigations embrace many elaborate methods to which perhaps too little attention has been devoted on this side of the Atlantic. It might be thought that electrocardiography was such a wide subject that it should embrace a whole volume to itself, but it is here disposed of in 52 pages so that we must agree with the conclusion that this chapter is intended to give the reader only an introduction to the subject even if it unfortunately conveys the impression that a normal electrocardiogram does not always exclude the presence of organic heart disease.

Chapter XIX which consists of a list of the minimum requirements and supplies, equipment and reagents to furnish pathological laboratories should impress the tyro with the truly herculean task which lies before him.

It is hardly necessary to state that this publication is beautifully produced and printed on the best art paper, that the illustrations are all that could be desired and that the binding is substantial as well as attractive. Such are the advantages of the absence of austerity in medical books to which the gravity of the times have accustomed us in Great Britain.

Search for misprints or inaccuracies has been in vain, but we would like to draw the attention of the able reviser of Chapter X to the Americanization of such a familiar name as that of Sabouraud. *P. Manson-Bahr*

GRADWOHL, R. B. H. [M.D., D.Sc., F.R.S.T.M. & H. (London), etc.] & KOURÍ, Pedro [Director, Institute of Tropical Medicine, Havana University, etc.]. **Clinical Laboratory Methods and Diagnosis. Vol. III. Parasitology and Tropical Medicine.** 4th Edition. pp. viii+864, 420 text figs. & 7 coloured pls. 1948. St. Louis: The C. V. Mosby Company. [3 vols. $40.]

This third volume is undoubtedly a book which will arouse considerable interest and no doubt give rise to some measure of comment, springing as it has done like a new constellation in the southern skies while aiming at a full account of tropical parasitology: in some respects it has succeeded in doing so: in others it has failed. Quite naturally stress is laid upon the not inconsiderable achievements of the Cuban and South American schools—and the book is none the worse for that.

The work is illuminated throughout by essays upon the underlying principles of helminthology and protozoology. Thus we find a history of these respective sciences and an enunciation of the nomenclature of parasitism, reactions of the organisms to infection and methods of diagnosis. The subject of medical protozoology is handled on biological lines and the amoebae, *E. histolytica* in particular, are minutely described and lavishly illustrated, but it must be confessed that the clinical section is not so fortunate; in treatment, in particular, an optimistic attitude is adopted. A large series of drugs is advocated, special prominence being given to the products of the Laboratorios Kuba. The intestinal flagellates, which are really of minor importance, are given perhaps

undue prominence. In a work on tropical medicine it might have been expected that malaria would occupy a position of prime importance, but in this expectation we are disappointed and find an inadequate and somewhat fallacious account crammed into some 27 pages. A coloured plate (Pl. IV) conveys what is now known to be an incorrect idea of the life history of the main species of human *Plasmodium*. No allusion is made to the exoerythrocytic cycle, but Schaudinn's original figure of the penetration of the sporozoite into the erythrocyte is reproduced (Fig. 47) as well as a purely imaginary diagram (Fig. 55) copied from Brumpt and Neveu-Lemaire showing a hypothetical tissue stage in the capillary endothelium in the case of *P. falciparum*. It conveys the impression that a study has not been made of the vast literature of this subject and imparts the idea that *P. falciparum* is the longest-living malaria parasite in the human body, through a misprint on p. 228 of this species for *P. malariae*.

In the same vein it is permissible to animadvert upon the section on human and animal trypanosomes, which enormous subject is dismissed in 13 pages, while the almost equally important subject of the leishmaniases is vouchsafed only two. In contrast to this meagre approportion, the section on helminthology, which is mainly based upon the observations of the junior author, is a massive affair occupying no less than 523 pages. It is illustrated by magnificent photographs mainly by Kouri, and also by fine line diagrams, so that it is questionable whether anything of its kind exists in any other publication. Some may consider it pretentious : others, rather unbalanced because considerable space is devoted to the rarer or accidental helminthic human infections. It is questionable, too, whether so much importance should be attached to infections such as trichuriasis and to the practice of crediting the whipworm with pathogenic properties on rather slender ground. To the clinician this constitutes rather a dangerous practice. In this connexion there is a remarkable plate (Fig. 65) depicting the hatching of the larval trichurids from the egg. No mention is made of the parasitic male of *Strongyloides stercoralis*. Again, undue space of 3 pages is given to *Heterodera marioni* (*radicicola*), the egg of which is merely fortuitous in the faeces.

To the reviewer, filariasis is naturally rather a hallowed subject and possibly on that account he is apt to be rather sensitive about the history of this important nematode, but in the case of the non-periodic form, referred to as "Filariasis in the Samoan area", the story is positively misleading, while the photograph of that handsome mosquito, *Aëdes scutellaris* (Fig. 163), is badly fogged. The crowning achievement is undoubtedly to be found in the description of the Cestoda which occupies alone 72 pages. Here great attention is paid to the rarer forms which are accidental in man. Thus twelve illustrations and as many pages are devoted to *Inermicapsifer cubensis* which has hitherto not been recorded except from Cuba, and the account is based upon specimens derived from some 75 cases.

Raillietina quitensis was described by Luis A. León in 1938, in Ecuador, where some human infections have been recorded ; it is another rare species, but no attempt has been made to unravel the obscure life history of either of these two cestodes or to discover their normal hosts. In a similar vein, great attention has been paid to *Hymenolepis* which appears to be a common intestinal parasite in Cuba. In direct contrast to this prolixity that section devoted to diseases caused by spirochaetes, viruses, bacteria and also those due to arthropoda constitutes an absolute anticlimax, and this vast amount of information which should require a volume on its own is dismissed in 65 pages.

In this review we have endeavoured to be fair in appraising the virtues of a notable production and at the same time pointing out some imperfections for the attention of the conscientious and diligent authors of this work on

parasitology. It is hardly necessary to add that the general finish and format of this book could hardly be bettered. *P. Manson-Bahr*

DUBOIS, Albert [Directeur de l'Institut de Médecine Tropicale d'Anvers, etc.] & VAN DEN BERGHE, Louis [Directeur de l'Institut pour la Recherche Scientifique en Afrique Centrale, etc.]. **Les maladies des pays chauds. Symptômes, diagnostic et traitement.** [The Diseases of Hot Countries.] pp. xvi+489, 100 figs. & 21 graphs. 1947. Paris: Masson et Cie, Editeurs, 120 Boulevard Saint-Germain.

This latest addition to the rapidly growing family of small books on tropical diseases deserves a hearty welcome from every French-reading medical man in the tropics. The authors state that their aim has been to provide in concise form reliable information with regard to the diagnosis and treatment of the chief diseases of hot countries. It can be said at once that they have achieved their object in a very successful manner. The book is well written and attractively produced. The subject matter has been carefully chosen, and the most exacting critic will find it difficult to discover errors in the text. The illustrations are excellent; they consist of 100 reproductions of photographs nearly all of which are original.

Diseases which are not appreciably more common in hot than in cool countries have been excluded; for example the brucelloses and spirochaetosis; but fortunately the authors have not adhered slavishly to their principle of selecting exclusively diseases of hot climates, otherwise they could not have admitted the helpful description of louse-borne typhus, a disease which flourishes specially in cold weather.

The classification, or rather the order of arrangement, of the diseases is based on their clinical features and on the regions of the body that are affected, not on the nature of the causative agents. This classification will doubtless arouse criticism in some quarters but it can be defended on the grounds of convenience and helpfulness to the doctor.

The scope of the book can best be shown by a summary of the contents; the figures in brackets show the approximate number of pages allotted to the various subjects.

I. *Geographical Distribution* (7). II. *Climatology* (12), including five pages on diseases caused by heat. III. *Cosmopolitan Diseases in the Tropics* (24). IV. *General Infections* (173), including sleeping sickness (36); Chagas's disease (9); visceral leishmaniasis (10); malaria (46); blackwater fever (10); relapsing fevers (11); rickettsial diseases (23); plague (10); yellow fever (10); dengue (3); and "three days fever" (3). V. *Intestinal Diseases* (78), including bacillary dysentery (8); amoebic dysentery and liver abscess (17); cholera (4); schistosomiases (18); hookworm disease (9); and other helminthic diseases of the intestines (14). VI. *Skin Diseases* (92), including leprosy (22); mycoses (10); yaws (9); and filarial diseases (38). VII. *Injuries caused by Animals and Plants* (9), including snake-bite (4). VIII. *Avitaminoses* (36).

Five pages are given up to a useful description of certain modern drugs, but many readers will grudge the allotment of eight pages to a series of diagrams showing the chemical structure of some important substances. The appendix of 16 pages dealing with some common and important laboratory methods will be very helpful to medical men working in isolated outposts.

The authors willingly admit that as professors at the Belgian *Institut de Médecine Tropicale d'Anvers* their personal experience and special knowledge are related chiefly to African diseases, but they claim that they have maintained a cosmopolitan outlook on the subject. On the whole this claim is justified

though the allotment of only four pages each to cholera and snake-bite would be considered inadequate for workers in countries in which these diseases are important.

The authors pay a graceful tribute to "*L'excellent 'Tropical Diseases Bulletin'*" which readers are advised to consult for detailed and up-to-date information.

An English version of the book is said to be in the course of preparation.

In one respect the book has been fortunate in the time of its appearance; important advances in connexion with treatment have been exceptionally numerous during the past two or three years, and all but the very latest have been incorporated by the authors. *John W. D. Megaw*

ROCKEFELLER FOUNDATION. INTERNATIONAL HEALTH DIVISION. **Annual Report 1947.** pp. ix+209, 13 figs. on 6 pls. New York: 49 West 49th Street.

To read the Annual Report of the International Health Division of the Rockefeller Foundation is to take a tour from Chile to China, to learn much about a mixture of diseases from Bwamba fever (undoubtedly the most common virus disease of man in West Africa, where there is also evidence of Japanese B encephalitis) to diphtheria, and to see the form of progress in subjects varying from Health Insurance to the training of Sanitary Engineers. That diverse mixture is the measure of the influence of the International Health Division, for none of the subjects is taken up lightly or without altering our general conception of the subject studied.

As is common, major parts of the report are devoted to yellow fever and malaria; the first includes an interesting account of serological studies of the virus, a statement of the epidemiology of jungle yellow fever in East Africa which most people will find illuminating, and much incidental matter of which the most intriguing is the application of nuclear physics to tracing the movements of mosquitoes, tagged in the larval stage by exposure to radio-phosphorus or radio-strontium. The section on malaria includes notes on the physiology of the parasite and accounts of work in several countries, of which the most interesting is perhaps the story of the effort to eradicate from Sardinia the anophelines which carry malaria. Influenza also receives considerable notice with an account of the relationship of the two viruses, their epidemiology, efforts to produce active immunization and unsuccessful ones to produce clinical cure.

There is a short but critical and thoughtful article on Medical Care. A writer who has surveyed trends in twelve countries emphasizes the increasing recognition of the importance of nutrition, housing, recreation, education and social security in the general field of medicine, and the necessity for Governmental interference if they are to receive proper attention, including the removal of economic barriers to adequate medical service. The defects in planning which he considers to be common are failure (except in Australia) to consider the types of staff required and the training needed to put the plans into practice; planning for the care of, rather than the prevention of, sickness; and inadequate provision for mental and rehabilitation services and the care of chronic sick. As minor defects he lists lack of appreciation of advances in other countries, and the disregard, except in Canada and U.S.A., of the need for auxiliary medical staff. The pleasure of reading the report is only mildly marred by disappointment that he was kept in ignorance of the fact that there is standardized training controlled by a national organization for some auxiliaries in Britain.

As constructive proposals the Report advocates a revolutionary change or re-orientation in medical education, the promotion of Health Centres, their association with teaching hospitals, and the extension by medical schools of their facilities to include the care of the health of a designated community of some 100,000 to 200,000 population.

There are many other subjects which could be mentioned with similar appropriateness in a review. It is a record of one year of highly constructive work.

G. Macdonald

SMART, John [M.A., D.Sc., Dept. of Zoology, University of Cambridge]. **A Handbook for the Identification of Insects of Medical Importance. With Chapters on Fleas** by Dr. Karl JORDAN, F.R.S., **and on Arachnids** by R. J. WHITTICK, B.Sc. 2nd Edition. pp. xi+295, 13 pls. (3 coloured) & 178 figs. 1948. June. London: British Museum (Natural History). [20*s*.]

The first edition of Dr. Smart's book was published in 1943 [see this *Bulletin*, 1944, v. 41, 328], and the call, within four years of publication, for a second impression and a second edition proves the continued need for an authoritative, but not too lengthy, guide to arthropods of medical importance. The present edition has been increased by some 30 pages of text and a number of new illustrations; the latter include an original drawing of *Tunga penetrans* to replace the previous and much less satisfactory illustration borrowed from Castellani and Chalmers. The section on *Glossina* has been lengthened to include fresh material concerning the geographical distribution and vegetative associations of different species of tsetse. Dr. Kenneth Mellanby has revised the chapter on Arachnids, and the life-cycle of *Sarcoptes scabiei* is now described as similar to that of *Notoedres* sp., in that all stages, except mature females, may inhabit small, almost invisible, moulting pockets in the most superficial layers of the stratum corneum. The chapter on anophelines contains a new table of malaria vectors, ranking in order of importance, contributed by Mr. H. S. Leeson. The most comprehensive alterations occur in the section on fleas, which Dr. Karl Jordan has re-written and extended by some 11 pages. Finally, a very welcome improvement is the much more comprehensive index added at the time of the second printing.

The second edition, as did the first, contains descriptions of such genera as *Gasterophilus*, *Hypoderma*, *Melophagus*, and *Haematopinus*. The inclusion of insects so seldom injurious to man in a book otherwise solely concerned with medical entomology seems unnecessary.

The first edition was published at 15*s*.; the second edition maintains the high standard of production of its predecessor, and in spite of its increased length sells at the remarkably low price of 20*s*.

R. M. Gordon

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